





Washington State
Department of Transportation

Consumable Inventory System Feasibility Study

Final Report

September 2004

DYE MANAGEMENT GROUP, INC.

Washington State
Department of Transportation

Consumable Inventory System Feasibility Study

Final Report

September 2004

Washington State Department of Transportation

Consumable Inventory System Feasibility Study

Table of Contents

■

Executive Summary

■

Timely, accurate information about consumable materials is critical to the Washington State Department of Transportation (WSDOT). Consumable inventory supports WSDOT's maintenance program by supplying materials such as deicer, guardrail, pesticides, and herbicides. This feasibility study demonstrates why replacing WSDOT's consumable inventory system is imperative to reduce costs, preserve public safety, improve service delivery, and maintain credibility.

A. The Problem

Consumable inventory is big business. WSDOT manages the largest consumable inventory in the state. WSDOT's purchase of consumable materials totals $19 million each year. It maintains an "on-hand" inventory valued at $22 million. The current system tracks over 13,000 items and executes 120,000 transactions each year.

The current system is poor. WSDOT's 20-year-old consumable inventory system cannot capture and present the information needed to support WSDOT's accountability, service delivery, and operational efficiency goals. The system does not support modern inventory management practices and cannot adequately respond to state emergencies or disasters.

A new system will address these problems and deliver significant benefits:

- **Cost Savings –** By providing inventory and maintenance managers with a modern decision support system, WSDOT could realize approximately $5.6 million in tangible benefits. The largest savings can be realized by increasing the inventory turn rate (the number of times inventory turns over each year) to something more consistent with contemporary practice. This would provide a reduction of $3.7 million in inventory overhead costs and approximately $14 million in committed cash.
- **Improved Public Safety and Avoidance of Liability –** The current system cannot capture critical information needed to track the usage and age of chemical commodities such as pesticides, herbicides, and deicer. The application of expired chemicals can present public safety issues or expose WSDOT to liability charges. A contemporary system would provide WSDOT records of when the chemicals were applied, what their age was when applied, and how much was applied in each location.
- **Enhanced Service Delivery –** The current inventory system does not provide management the analytical and strategic information required to support supply decisions and efficient operations. Additionally, system inventory counts do not always accurately reflect the physical inventory. This creates service delivery issues including:

- **Inefficient Use of Maintenance Staff –** Maintenance staff spends a great deal of time shopping for commodities needed to support critical maintenance activities, often purchasing items outside of state contracts. Staff also spends a great deal of time maintaining overstocked material.
- **Service Delivery Delays –** The reorder process in the current system is not adequate to assure that sufficient supplies are ordered and received in a timely manner. In addition, there is no tie between planned maintenance activities and inventory levels. This causes lapses in inventory. When needed commodities are not available, maintenance activities are delayed.

- **Maintaining Credibility** – The current system lacks the basic business controls to ensure that materials are properly used and accounted for. Security is inadequate. Items can be taken from inventory with no record of who took them. This leaves WSDOT open to pilferage or mishandling of materials. This not only may be costly, but also may affect the public's view of how WSDOT is caring for tax-supported resources.

B. A Statewide Issue

This study documents the expected benefits, costs, and risks that WSDOT would realize given a modern inventory management system. WSDOT realizes other agencies have similar issues with their consumable inventory systems and recognizes the need and opportunity for a statewide solution. WSDOT sponsored and promoted the Enterprise-wide Consumable Inventory Team (ECIT), which consists of professional inventory managers from various levels of different state agencies, to oversee the development of this study. There needs to be additional work to update feasibility study costs, benefits, and risks to meet the needs of the rest of state government.

C. The Solution

Dye Management Group, Inc. recommends that WSDOT pursue a statewide solution so that the cost of implementation and ownership can be shared with other agencies. The Office of Financial Management (OFM) is currently considering implementation of an Enterprise Resource Planning (ERP) system to replace the state's core financial and administrative systems. This scope includes inventory management. We recommend WSDOT lead the statewide implementation of consumable inventory management for this ERP.

The cost incurred by WSDOT to implement consumable inventory management as part of an ERP would be approximately $4.5 million, including maintenance and operations for the first five years of system operation. The break-even period based on the estimated cost and savings would be approximately three years. There is the potential to realize an estimated $5.6 million in tangible benefits over the first five years of operation.

This ERP solution supports the State of Washington's "Priorities of Government" (POG)[1] by providing a modern inventory management system that will greatly improve the efficiency and effectiveness of WSDOT's maintenance, repair, and operations (MRO) services and practices.

In addition, this solution supports a recent directive by OFM[2] that asks "the Department of General Administration, in coordination with other agencies, to submit a proposal on supply chain management with the objective of reducing the costs of procurement, inventory, warehousing, and the transportation of goods and services."

Since the WSDOT implementation will provide much of the functionality required by other agencies, it is reasonable to expect that system costs identified above ($4.5 million) be shared with those agencies. This is likely to significantly reduce the cost to WSDOT, and reduce the payback period for the investment.

When determining individual agencies' share of the cost, the state should consider the full cost of statewide implementation of an ERP-based solution. Additional work is required to determine the costs, benefits, and risks of a statewide implementation, using this study as a starting point. Once that information is available, WSDOT should work with OFM, General Administration, and other key agencies to develop cost allocation and chargeback mechanisms for supporting initial system implementation and maintenance costs.

D. Key Risks

It is critical to the successful implementation of the proposed solution that potential risks be identified and communicated, and that a risk management strategy be developed and implemented along with appropriate quality assurance and project oversight. The following describes the most significant risks.

1. Delays in Other Projects

Any implementation of a statewide finance and administration ERP system will not begin until the state has completed its implementation of SAP HRMS. If this project does not meet its milestones or if the statewide finance and administration ERP strategy is stalled or fails to get funding, then WSDOT will not realize a timely ERP consumable inventory solution.

To manage this risk, WSDOT and the ECIT must monitor the progress of the state's SAP HRMS implementation and schedule and the activities of the statewide finance and administration ERP efforts. If milestones are not met, or if the ERP strategy is

[1] Presentation Material for the Priorities of Government Question and Answer Sessions offered by the Office of Financial Management, February 27, March 1, 2, and 4, 2004.
[2] Additional Instructions for Agency Budget Submittals: Memo from Office of Financial Management to Rob Fukai, Director, Department of General Administration, July 8, 2004.

stalled or cancelled, then WSDOT and ECIT should consider a Best of Breed consumable inventory management systems solution.

2. Current System Failure or Loss of Key Support Staff

WSDOT's current legacy consumable inventory system is old, fragile, and at risk of failure. In addition, a limited number of personnel have experience supporting the current system. If the system fails, or if WSDOT loses its support staff, then WSDOT would be without a consumable inventory system and means to supply mission-critical materials to WSDOT maintenance activities.

To preserve the current system until it is replaced, WSDOT must develop a risk mitigation strategy to thoroughly test upgrades before implementation. To preserve support for the current system until it is replaced, WSDOT must document system support tasks and train backup support staff.

E. Cost of Delay

The cost of delay is significant. This study recommends the project start July 2006 after DOP has completed its SAP HRMS implementation. Each year the project is delayed WSDOT will lose approximately $3 million in estimated annual benefits.

I. Background

■

A. Overview

The Washington State Department of Transportation (WSDOT) in support of its mission has stated a policy objective to "(c)ontinuously improve the efficient and effective delivery of agency programs." This policy supports the State of Washington's Priorities of Government Budget Approach for Developing the 2005-2007 Budget that directs agencies to "(i)mprove the ability of state government to achieve its results efficiently and effectively."

In response to these expectations, the Washington State Department of Transportation (WSDOT) must provide an efficient and effective means to manage the large quantities of consumable goods that are necessary to deliver its services.

Consumables are materials purchased and placed in a stores condition such as a warehouse, yard, or stockpile site for later use. These materials are continuously consumed and replaced throughout the year.

Daily maintenance, repair, and operations of WSDOT annual activities require approximately $100 million in consumable inventory transactions and depend on over $21 million worth of in-stock supplies and materials being readily available in safe, clean, and working condition at over 700 locations statewide.

WSDOT must replace its current consumable inventory management system for the following reasons:

- It does not support service delivery and accountability goals of WSDOT.
- It is a risk to the business continuity for WSDOT.
- It cannot share inventory information with other agencies.

The current system, which has been in use for over 20 years, does not effectively support the mission of WSDOT. The inflexible architecture and insufficient capabilities of the current system have made it difficult for WSDOT to respond to increased demands for accountability and operational efficiency. While the current system can record inventory activity, some of the capabilities it does not provide are:

- Strategic analysis information to support inventory planning and management activities.
- Business controls such as robust systems security, online approvals, and audit-trail tracking of user activity.

- Support for modern inventory management "best practices" and tools.
- Integration with agency systems such as finance, purchasing, and maintenance management systems.
- Integration with enterprise data repositories such as vendor, commodity, contract, organization, and chart of accounts data.
- Visibility to the true cost of the inventory and inventory overhead.
- Efficient means to input data.
- Operational support by delivering "real-time" inventory status and tracking.
- Automated data integrity checks to ensure correct data entry.

The current system is a risk to the business continuity for WSDOT for the following reasons:

- The current system architecture is out-dated, difficult to use, and cumbersome to maintain and modify. It is comprised of character-based user interfaces with COBOL and Adabas mainframe technology and flat file data repositories.
- Because WSDOT consumable inventory system is based on 20-year-old technology, it is difficult to find, hire, train, and retain staff to maintain the system.

The current system does not provide an opportunity for WSDOT to share inventory information with other agencies. Because of its design and technical platform, it is unlike inventory and financial systems used by other agencies. This creates a barrier to sharing inventory information and coordinating purchasing programs with other agencies. More importantly, lack of an enterprise view of the state's consumable inventory hinders the state's ability to locate needed materials when responding to emergencies and natural disasters.

Finally, WSDOT realizes other agencies have similar issues with their consumable inventory systems and recognizes the need and opportunity for an enterprise solution. To this end, WSDOT sponsored and promoted the Enterprise-wide Consumable Inventory Team (ECIT), which consists of professional inventory managers from various levels of different state agencies to oversee the development of this study.

B. Project Overview

The Enterprise-wide Consumable Inventory Team (ECIT) was formed in 2001 to define requirements for the next generation of automated inventory management for WSDOT. The team consists of professional inventory managers from various levels of different state agencies who have one common goal – to develop a system that will return the best value on taxpayer investment. The ECIT expects the following benefits from a modern, statewide consumable inventory system:

- Reduced levels of inventory.
- Faster, more efficient turnover of inventory.
- Reduced cost of inventory.

Toward that goal, the ECIT agreed to follow the guidelines established by the Information Services Board (ISB) in its core systems framework to assess and document the need, impact, and feasibility of a statewide inventory system. Agencies having consumable inventories were invited to participate in this effort at whatever level they could afford. The ECIT believes that by pooling their collective time, talent, and experience, a common inventory system can be found to meet the needs of all state agencies at the lowest cost. They also understand that it is important to demonstrate to individual department executives how this investment will result in maximum value to the citizens of Washington State.

The ECIT defined the following vision and goals for a new consumable inventory system.

- **Vision.** Create an enterprise consumable inventory system to provide effective financial and materials management of Washington State resources.
- **Goals**

  (1) A system that supports one data entry between purchasing, inventory, and accounting systems. *Inventory* means receipt, storage, issue, disposal, and replenishment.

  (2) A system that improves agencies' ability to meet materials management requirements with the ability to work collaboratively with other agencies.

  (3) A system that improves the state's abilities to meet financial accountability requirements.

  (4) Statewide consistency for agencies that increases program delivery effectiveness and economy through:

  - Reducing cost of acquisition, maintenance, and operations processes.
  - Supporting materials requirements planning.
  - Increasing purchasing power.
  - Reducing costs for intra- and inter-agency cross training.
  - Promoting common data definitions.
  - Producing more reliable, accurate, and timely management reports.

  (5) A system that is flexible enough to meet diverse and evolving agency business requirements.

(6) A system that is "scalable" and allows future upgrades.

(7) A system that supports the statewide business resumption and disaster recovery efforts.

1. Project Objectives and Scope

The objective of this project is to complete a feasibility study for the Washington State Department of Transportation (WSDOT) Consumable Inventory System with consideration toward a statewide solution for state agencies, following the Washington State Department of Information Services and Information Services Board guidelines.

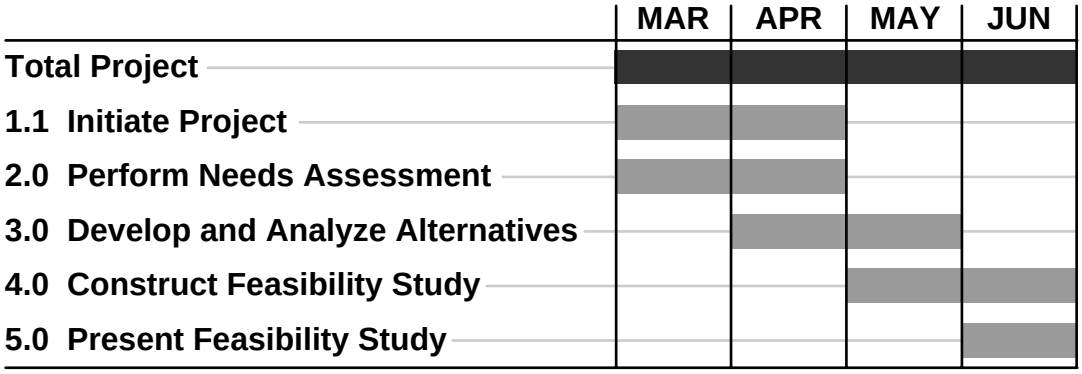
The scope of this project is limited to the consumable inventory management processes and systems, which enable maintenance, repair, and operations (MRO) activities for WSDOT. In addition, the project team met with staff from the Washington State Ferries, Department of Social and Health Services, and Department of Corrections to understand their consumable inventory systems and processes. Excluded from the scope of this project are other WSDOT systems that track fixed assets.

This study documents the expected benefits, costs, and risks that WSDOT would realize given a modern inventory management system. A statewide feasibility study must be developed to understand thoroughly the benefits, risks, and costs for the enterprise.

2. Project Schedule and Approach

Exhibit I-1 contains a summary of the project schedule.

Exhibit I-1: Project Schedule Summary



The project included the following major tasks:

a. Initiate Project

The project initiation phase established the project team, set project scope and objectives, and developed the project schedule, work plan, communications strategy, and work products.

Appendix A provides a list of the core project team and the Enterprise-wide Consumable Inventory Team (ECIT) members.

b. Perform Needs Assessment

In order to define and assess WSDOT's consumable inventory needs and gain an understanding of the requirements of other agencies, the following tasks were performed:

- **Executive Interviews** –WSDOT executives were interviewed to develop an understanding of their perspectives, visions, and views as to the major technology challenges and opportunities related to WSDOT's consumable inventory.

  Appendix B lists the executives interviewed.

- **Focus Group Sessions with Subject Matter Experts –** Focus group meetings were held with various WSDOT and other agency consumable inventory subject matter experts to understand issues facing the current environment and requirements for a new system. These focus groups were organized with the help of WSDOT and ECIT. The focus groups were organized into the following logical groups: inventory management, customers, accounting, and ECIT.

  Appendix B lists the participants of the various focus groups.

- **Site Visits -** Site visits were made so that the project team could interview inventory management and staff and tour a variety of consumable inventory control points.

  Visits were made to the following WSDOT facilities:

  – Olympic Region Purchasing Office and Central Stores.

  – Tacoma Maintenance Stockpiles and Pesticide Stores.

  – South Central Maintenance Area 3, Pasco.

  – South Central Maintenance Area 2, Selah.

- Northwest Region Purchasing Office.
- Washington State Ferries (WSF), demonstration of their Maintenance Productivity Enhancement Tool (MPET).

Visits were made to the following DSHS Western State Hospital sites in Steilacoom:

- Central stores warehouse.
- Maintenance warehouse.
- Medical supply warehouse.
- Dietary food service warehouse.
- Purchasing and finance office.

Visits were made to the following DOC facilities in Shelton:

- Food service warehouse.
- Central warehouse.

- **Documentation Review -** The project team reviewed documentation created by the ECIT, process maps, systems documentation, various business plans, and strategy documentation developed by WSDOT, OFM, and DIS.

c. Develop and Analyze Alternatives

A cost, benefit, and risk analysis was performed on solution alternatives to determine which provides an enterprise solution that meets the business and technical needs of WSDOT as defined by the ECIT.

d. Construct Feasibility Study

The Feasibility Study documents the combined needs assessment and alternatives analysis with a strategy for implementing the recommended solution.

e. Present Feasibility Study

The results of the Feasibility Study are presented to the ECIT.

C. Business Service Goals and Strategies

This section highlights the enterprise and WSDOT business strategies and goals that guide the selection of a consumable inventory solution.

1. Business Service Goals

WSDOT Purchasing and Materials Management (PMM) Office, which oversees purchasing and material management policies and administers WSDOT's consumable inventory system, has set performance objectives to improve the accountability, visibility, and standardization of WSDOT's consumable inventory management systems and processes. The PMM Office has developed a specific business plan for the 2003 – 2005 biennium to achieve its performance objectives. These include replacing the legacy consumable inventory system and establishing standard, department-wide processes for procurement and supply management.

2. Business Strategies

The current business direction within the State of Washington is a focus on service delivery balanced with the accountable and efficient use of public funds and state resources. These goals direct agencies to eliminate administrative "silos" and to work towards enterprise solutions so that agencies can focus on service delivery rather than support duplicate administrative systems and information repositories.

a. Priorities of Government[3]

The State of Washington's "Priorities of Government" (POG) Budget Approach for Developing the 2005-2007 Budget provides a framework to assess agency budget requests against statewide success indicators. The state has identified eleven key results that citizens expect. These results are defined as the "POG 11." Budget requests are studied to determine their contribution towards achieving the POG 11.

The eleventh POG result states "Improve the ability of state government to achieve its results efficiently and effectively."

As seen in the Business Case section of this report, there is a significant opportunity to improve upon the efficiency and effectiveness of WSDOT's maintenance, repair, and operations (MRO) services through the implementation of modern inventory management systems and practices.

[3] Presentation Material for the Priorities of Government Question and Answer Sessions offered by the Office of Financial Management, February 27th, March 1st, 2nd and 4th, 2004.

b. WSDOT

The mission of the Washington State Department of Transportation is as follows:

"The Washington State Department of Transportation keeps people and business moving by operating and improving the state's transportation systems vital to our taxpayers and communities."[4]

Toward this end, WSDOT has stated a policy objective to "(c)ontinuously improve the efficient and effective delivery of agency programs."[5]

The requirements identified for a new consumable inventory system support WSDOT's continuous improvement goals. By meeting the defined requirements, WSDOT will have visibility of inefficiencies and service gaps within the consumable supply chain. This information will allow inventory managers to set policy and make decisions that demonstrate the efficient use of state resources while effectively supporting the department's service delivery goals.

As seen in the Business Case section of this report, a modern consumable inventory system that enables inventory management "best practices" supports the Washington State Department of Transportation's Management Principles,[6] which are:

- Leadership.
- Delivery and Accountability.
- Business Practices.
- Safety.
- Environmental Responsibility.
- Excellence and Integrity.
- Communications.

c. Office of Financial Management (OFM)[7]

Through the Blueprint for Statewide Financial Systems, which was accepted in 2000, the Office of Financial Management researched opportunities to provide a financial and administrative systems solution, which supports the following objectives:

[4] Washington State Department of Transportation Management Principles, April 2002.
[5] Section 2 – WSDOT Strategic Direction 08/08/03.
[6] Washington State Department of Transportation Management Principles, April 2002.
[7] State of Washington Recommendation for Financial and Administrative Systems presentation May 4, 2004.

- Accountability to Constituents.
- Cost Savings.
- Service to Constituents, Vendors, and Employees.
- Business Alignment.

OFM believes modern, integrated financial and administrative business processes and systems would best meet the state's business objectives. The expected benefits include:

- Increased ability to standardize and streamline business processes statewide.
- Optimized use of resources by achieving economies of scale.
- Improved alignment with management practices and the "Single Face of Government" strategy.
- Increased accessibility, accuracy, and usefulness of information.
- Reduced cost of ownership (skill sets, tools, and architecture), duplication of effort, and redundant systems.

OFM is considering the implementation of an integrated Enterprise Resource Planning (ERP) solution to meet the state's business objectives. The Department of Personnel (DOP) is currently implementing a statewide SAP ERP human resource management and payroll solution.

In July 2004, OFM distributed a memo to the Department of General Administration[8] that asks "the Department of General Administration, in coordination with other agencies, to submit a proposal on supply chain management with the objective of reducing the costs of procurement, inventory, warehousing, and the transportation of goods and services."

In 2002, OFM distributed a memo to state Chief Information and Technology officers that states the OFM and the Information Services Board (ISB) must approve agency investments in financial and administrative systems. Before requesting funding, agencies must first try to find a central system that can meet its needs or look for an opportunity to collaborate with other agencies to find a common shared solution. [9]

Prior to this study, the ECIT and WSDOT did not find a sufficient consumable inventory system within the state, which could effectively replace WSDOT's

[8] Additional Instructions for Agency Budget Submittals: Memo from Office of Financial Management to Rob Fukai, Director, Department of General Administration, July 8, 2004.
[9] Approval Requirements for Agency Investments in Financial/Administrative Systems: Memo from Office of Financial Management to Agency Directors, Chief Financial Officers, and Chief Information Officers, November 1, 2002.

current system. Therefore, WSDOT and ECIT have collaborated to find an enterprise solution, which will meet the needs of WSDOT and other state agencies.

d. Approach to ERP Roadmap

OFM is currently sponsoring an effort to define a roadmap to migrate state financial and administrative systems onto an ERP platform. This is a two-year project, which will generate plans for the following:

- Business Process Modeling.
- Governance Model.
- Enterprise Technical Architecture.
- Staffing Knowledge Transfer
- Operational Support

Since inventory management has been defined as being within scope for the ERP implementation, the consumable inventory management solution selected by WSDOT must either align with OFM's direction or have an acceptable business case for diverging from the ERP Roadmap.

e. Technology

WSDOT Information Technology Portfolio, which serves as the basis for making information technology decisions and plans, recognizes that many systems do not support efficient business processes.

"WSDOT is currently faced with significant challenges in the area of Information Technology. Aging and non-integrated computer systems that hinder rather than support an efficient business process combined with an aging infrastructure that is in urgent need of updating and replacement, together with the need to develop a comprehensive and easily accessible data warehouse create many challenges for those who rely on the agency's information systems."[10]

WSDOT sees a benefit in contributing to the statewide IT Plan.

"WSDOT develops IT plans within the context of the State IT Plan. Whenever possible, WSDOT takes the opportunity to support the State IT Plan. In addition, WSDOT contributes to the establishment of statewide direction by participating on various statewide focus groups and teams."[11]

[10] WSDOT IT Portfolio – 08/08/03.
[11] Ibid.

WSDOT IT portfolio stresses the importance of providing applications that are well integrated, flexible, designed to meet business needs, leverage new technologies to support improved service delivery, ensure security and reliability of products and services, and provide efficient access to mission critical information.

D. Business Case

This business case highlights WSDOT's immediate need for a modern consumable inventory management system. This business case illustrates how current business processes are limited by system capabilities and how management decisions are hampered by the information provided by the system. The business case is organized into the following sections:

Current Inventory Environment – describes the size and scale of the current consumable inventory environment.

Inventory Management Opportunities – presents cost savings, accountability, and service delivery improvement opportunities that can be achieved with a system that provides inventory managers more timely, accurate, integrated, and detailed inventory information.

Overview of High-Value Commodities – discusses specific issues related to WSDOT's highest valued commodities.

1. Current Inventory Environment

The total value of the consumable inventories managed by the State of Washington is $88,397,033. WSDOT manages the largest consumable inventory in the state.

The following chart shows inventory values for agencies having more than $100,000 of consumables (GL 1410) and donated (GL 1415) inventories as reported on the 2000 through 2004 CAFR reports.

	2000	2001	2002	2003	2004
WSDOT	$24,964,399	$27,219,625	$26,058,378	$27,492,738	$27,505,211
UW	$16,530,707	$16,662,475	$17,903,606	$18,272,265	$18,272,265
WSU	$15,998,118	$6,883,165	$6,471,568	$7,086,287	$6,974,529
DOC	$6,925,267	$7,191,747	$6,520,817	$6,471,186	$7,137,402
DSHS	$6,392,317	$6,149,360	$6,612,321	$6,534,083	$6,189,366
All Others	$14,892,004	$16,116,001	$14,976,683	$18,792,268	$22,318,260
Total	**$85,702,812**	**$80,222,373**	**$78,543,373**	**$84,648,827**	**$88,397,033**

WSDOT has six regions, 29 maintenance areas, and 708 inventory control points that have material stores, stockpiles, and Washington State Ferries (WSF) consumables.

Within the past year, WSDOT purchased approximately $19 million of consumables and issued approximately $17.7 million of consumables.

The total value of the inventory as of June 1, 2004 was $21.6 million.

There are about 13,881 active and inactive commodities tracked by the current consumable inventory system.

The system records about 120,000 inventory transactions each year.

Of the total 13,881 commodities, 146 commodities or about 1 percent of the total represent 80 percent of the total value of the inventory or $17.44 million dollars!

2. Inventory Management Opportunities

a. Inventory Turns

The inventory turn rate identifies the rate at which the inventory turns over in a given year. It is calculated by dividing the total dollar amount issued in a year by the average amount of inventory on-hand for the 12 months of that year. The inventory turn rate would be $17.7 million / $21.8 million, which equals 0.81.

What is significant about an inventory turn rate of 0.81 is that the days of supply calculate to be 450 days!

Inventory that sits in storage for such a long period presents the following issues:

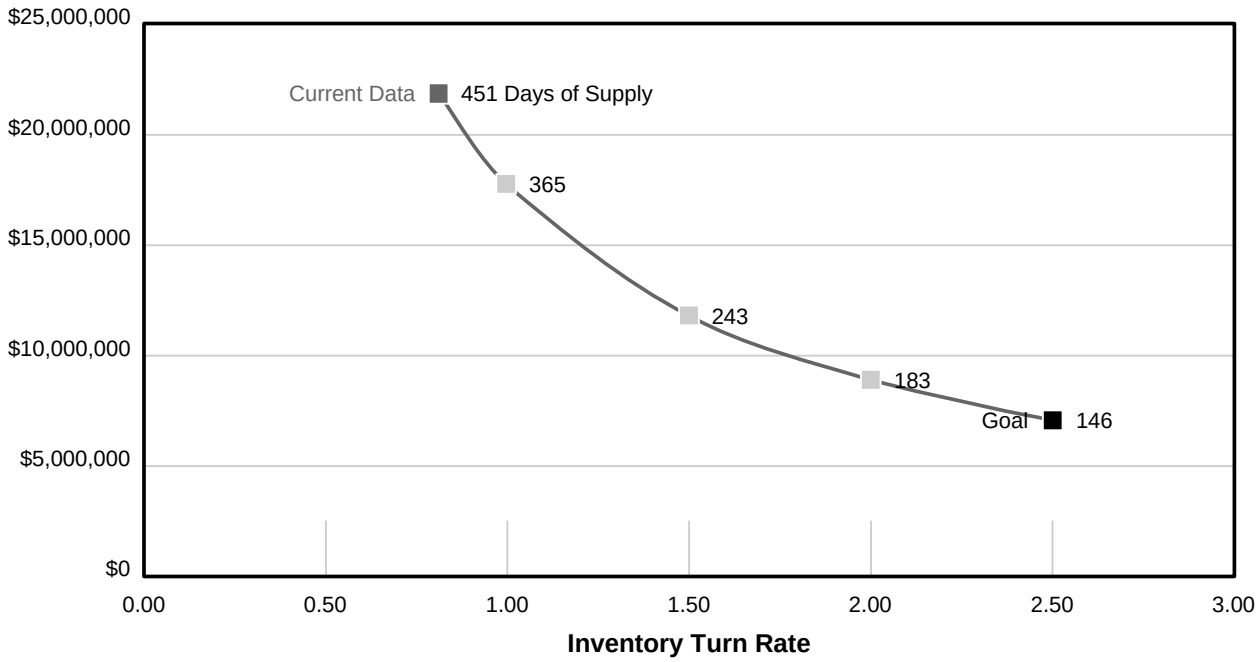
- The inventory can be lost, damaged, or stolen.
- Cash used to buy the unused commodities is not available for other purposes.
- Since the inventory must be managed, secured, and maintained; inventory overhead costs are increased.

Exhibit I-2 shows potential reductions in inventory and cash commitments when inventory turn rates are increased. In private industry, inventory overhead costs are estimated as 35 percent of the average on-hand inventory value. Since WSDOT owns its inventory control points, a conservative rate of 25 percent has been used. The goal for WSDOT is to incrementally increase the annual inventory turn rate from 0.81 to 2.5. Exhibit I-3 demonstrates the effect of inventory turn rate on inventory levels and days of supply for all programs as a graph. The impact on increasing the turn rate for specific categories of inventory within WSDOT is presented in Appendix F.

Exhibit I-2: Inventory Turn Rate

	Annual Amount Issued	Inventory Turn Rate	Average Inventory Level	Days of Supply	Inventory Reduction	Inventory Overhead Cost
Current Data	$17,700,000	0.81	$21,850,000	451		$5,462,500
	$17,700,000	1.00	$17,700,000	365	$4,150,000	$4,425,000
	$17,700,000	1.50	$11,800,000	243	$10,050,000	$2,950,000
	$17,700,000	2.00	$8,850,000	183	$13,000,000	$2,212,500
Goal	**$17,700,000**	**2.50**	**$7,080,000**	**146**	**$14,770,000**	**$1,770.000**

Exhibit I-3: Effect of Inventory Turn Rate on Inventory Levels and Days of Supply for All Programs



b. Inventory Adjustments

WSDOT has a responsibility to the public to ensure efficient and effective use of state assets including consumable inventory. Significant inventory adjustments represent breakdowns in the management process and lapses in accountability. Adjustments to inventory are made when the physical inventory count does not match the count in the system and the value recorded on the general ledger. This happens when inventory is lost, stolen, found, or is not sufficiently tracked. As seen in the charts below, the current consumable inventory management

environment at WSDOT is very volatile. Large inventory adjustments reveal the following problems:

- The inventory is not sufficiently controlled. This could mean that there are too few physical counts of the inventory. It could also show that the physical receipts and issues of stock are not accurately recorded into the system and general ledger.
- Visibility to the inventory has been lost. This presents a liability issue for hazardous commodities such as pesticides or deicing material. In addition, there is no way to track when the inventory was used, who pulled the inventory, or under which work order a commodity was used.
- Fiscal management of the inventory is insufficient and needs improvement.
- The inventory item has become obsolete, requiring it to be "written off" in order for it to be removed from the inventory system and disposed of.
- Purchasing and fulfillment of inventory levels are most likely skewed, since buyers do not have an accurate count of the inventory levels.
- Personnel are spending significant time looking for inventory that does not exist or shopping for a commodity that should be on hand.

The goal for WSDOT is to keep inventory adjustments within a range of 0.5 percent of total inventory value for a year (about $100,000 per year). Over the past seven years, WSDOT has made adjustments totaling $1.2 million dollars of inventory**. If WSDOT had met its adjustment goal for the past 7 years, then WSDOT would have saved $500,000!**

Exhibit I-4 shows inventory adjustments M2 and M5 subprograms over the past four biennia. "M" refers to WSDOT Highway and Maintenance Operations Program. "M2" Maintenance Subprogram provides for maintenance and operation of the state highway systems and related facilities in order to preserve the highway system in its original or subsequently improved condition. "M5" Inventory and Stores Administration Subprogram provides for acquisition and administration of stores and stockpiles. Significant items are signs, traffic signal parts, illumination parts, engineering supplies, pits, and processed mineral aggregates in stockpiles.

Exhibit I-4: Inventory Adjustments – M2 and M5

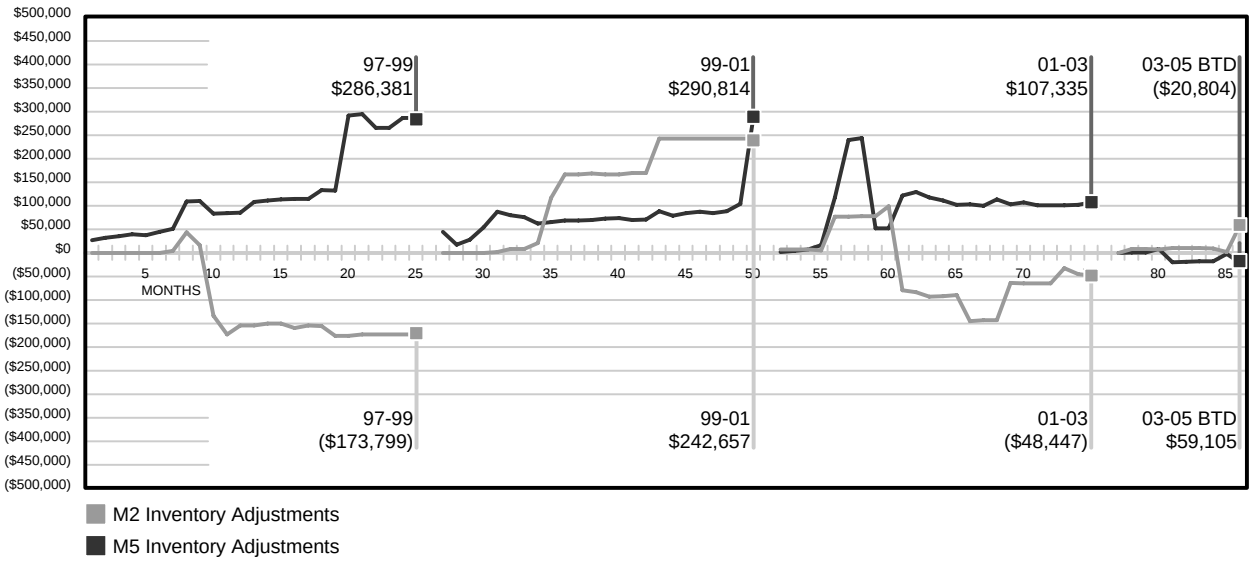


Exhibit I-5 shows the inventory adjustments for the Washington State Ferries for the same period.

Exhibit I-5: Inventory Adjustments – WSF

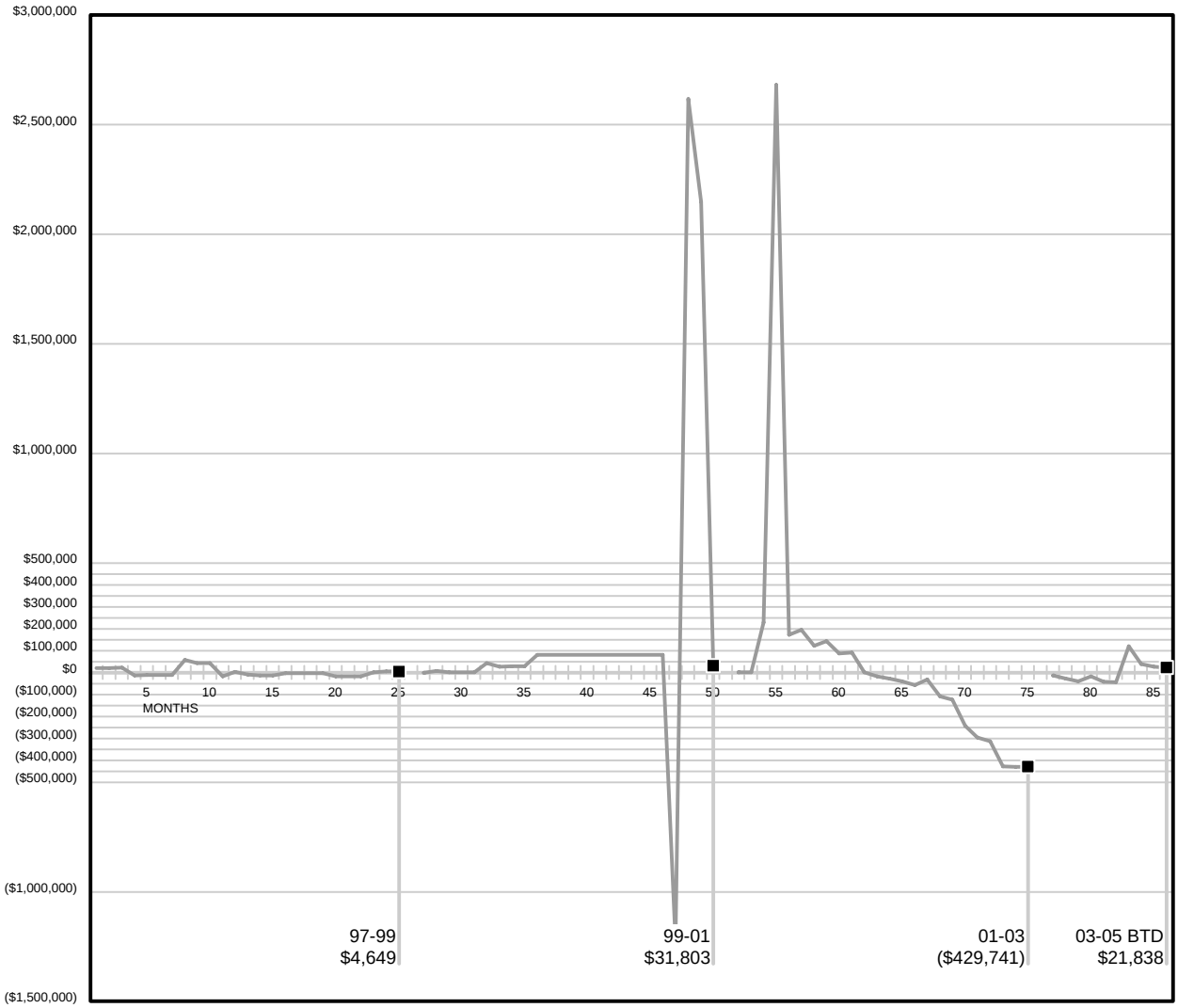
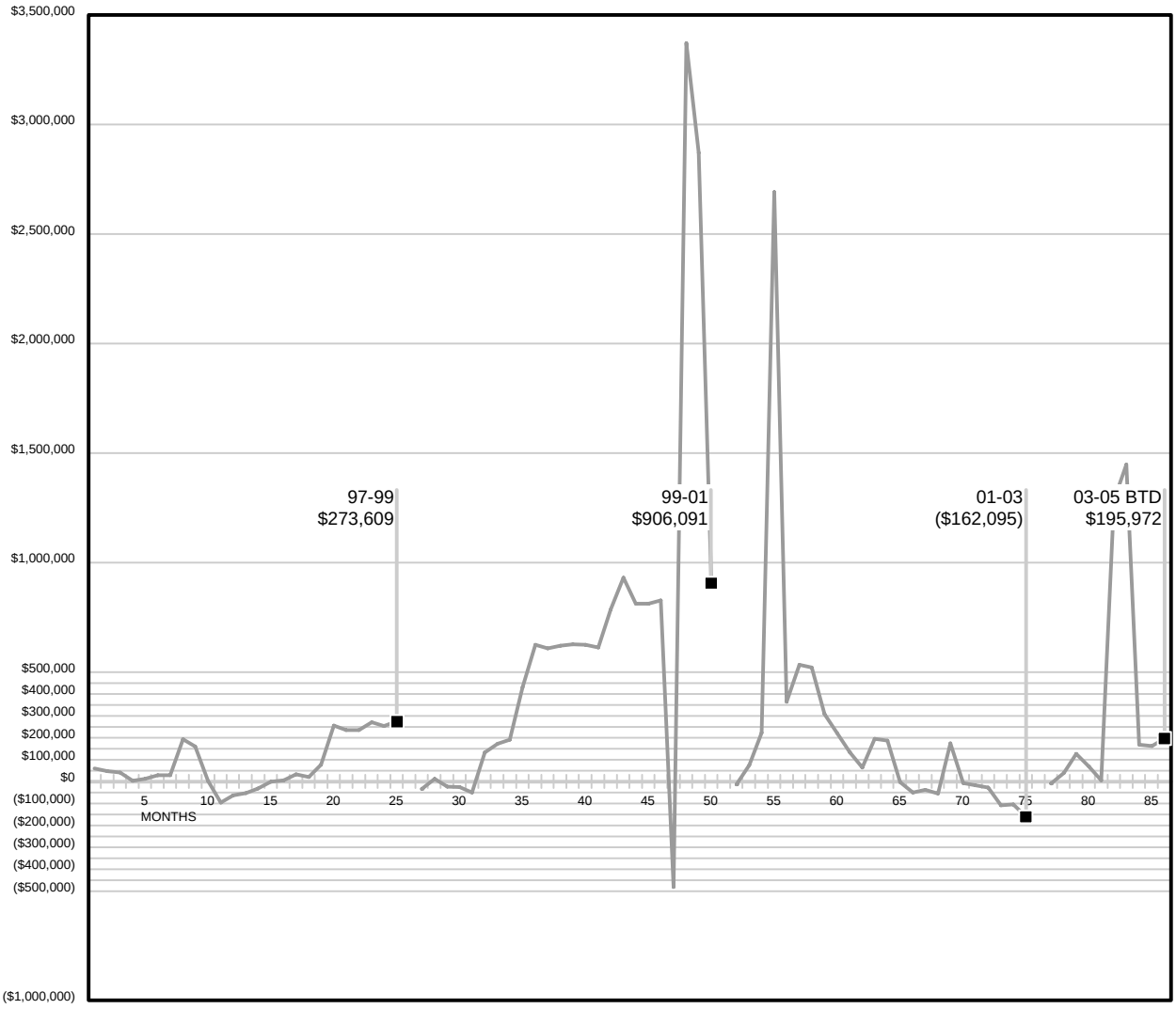


Exhibit I-6 shows consumable inventory adjustments made by WSDOT over the past four biennia.

Exhibit I-6: Inventory Adjustments – All Programs



c. Trend to Buy Direct

WSDOT has discovered a growing trend by maintenance groups to bypass the inventory accountability process and directly expense consumable inventory commodities. This trend to buy direct presents the following issues:

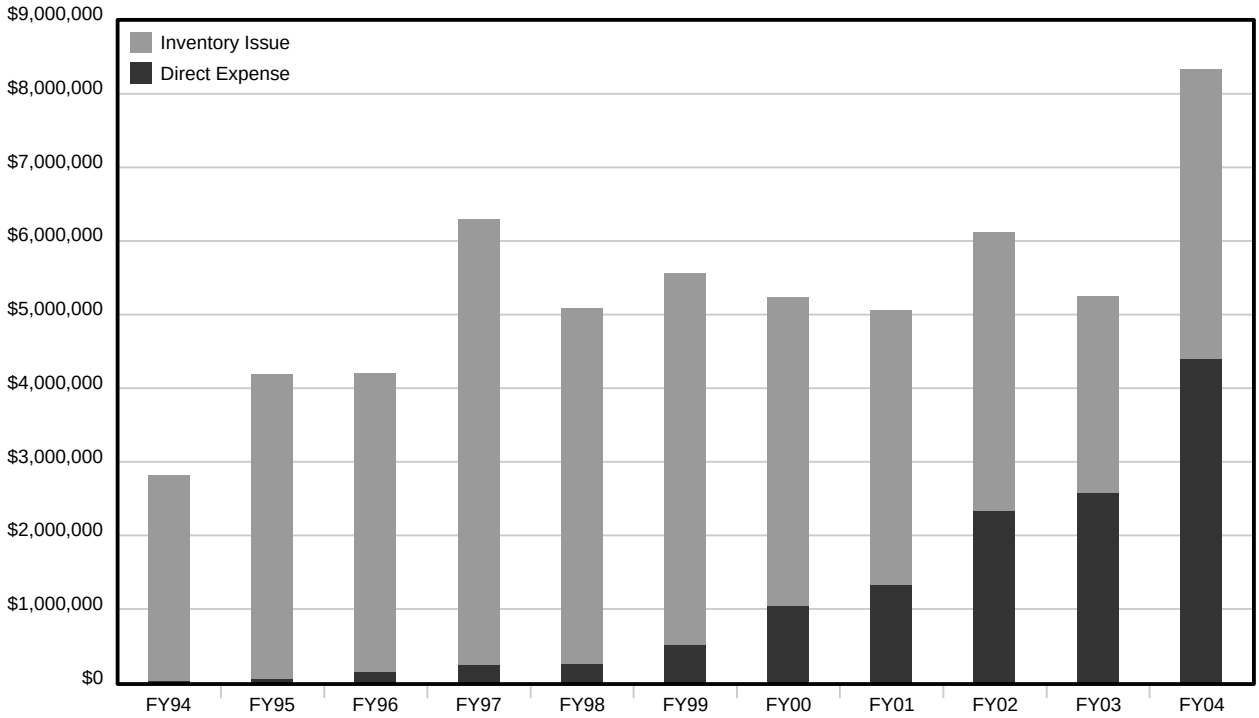
- The commodities purchased directly are not visible to management. WSDOT believes there is significant unrecorded inventory. The consumable inventory system is the only means that WSDOT has to track commodity level data such as usage and trends. Direct purchases impede

WSDOT's accountability goals. It also affects contract negotiations because it is unknown exactly how many purchases have been made from a particular vendor.

- Purchases for these items are often not planned but are last minute reactive purchases. Reactive ordering may translate to more frequent smaller orders and incur unnecessary freight charges. This means maintenance staff spends more time shopping and buying commodities rather than their primary function of performing maintenance tasks. In addition, WSDOT may miss out on vendor discounts or other efficiencies realized through planned ordering.
- Those purchasing directly do not want to use the current inventory system or processes to record the commodity into inventory. Staff may be under the false impression that buying direct saves time. In reality, they end up spending significant time looking for inventory, reconciling the system, and responding to lapses or overstocks in inventory.

Exhibit I-7 shows the trend in relation to deicing material purchases.

Exhibit I-7: Deicing Materials



d. Surplus Inventory

WSDOT has discovered a significant amount of commodities in inventory that have had no usage in the past year. Some commodities that have had no usage

may be considered critical to MRO activities and must remain on hand. The current system will not calculate an unused commodity as surplus if it has been flagged as a critical commodity.

There is a significant opportunity to reduce non-critical surplus. Approximately 10,080 of the total 13,881 consumable commodities have had no usage this past year.

- Approximately 31 percent or 770 commodities within store inventories, which consist of 2463 active commodities, are valued at $707,000 and have had no usage in the past year.
- Approximately 77 percent or 5104 commodities within WSF inventories, which consists of 6679 active commodities, are valued at $5,776,556 and have had no usage in the past year.
- Approximately 28 percent or 12 commodities within stockpile inventories, which consists of 43 active commodities, are valued at $538,548 and have had no usage in the past year.

Assuming that half of the current unused inventory is not needed, the estimated savings amount of reducing the unused inventory by 50 percent would be $353,500 for stores, $2,888,278 for WSF, and $269,274 for stockpiles.

When inventory is not used, then the following issues arise:

- WSDOT has expended funds to buy inventory that is not used.
- WSDOT is not making informed purchases based on accurate inventory levels and demands.
- Resources are focused on the maintenance and management of unused inventory rather than on other service delivery efforts.
- Unused inventories are at risk of being damaged, lost, or of becoming obsolete.
- WSDOT is incurring inventory overhead costs to maintain unused inventory.

e. Inventory Planning

The current systems environment cannot support proactive inventory planning and purchasing. Purchasing managers and supply officers are not always aware of maintenance area inventory needs related to inventory trends, planned maintenance activities, and special projects. Maintenance areas reactively call the purchasing managers or supply officers to get needed stock or they go to local businesses to fill urgent material needs (outside of contracts).

The impacts of reactive purchases are the following:

- On-hand inventory is not sufficient to support business demands.
- Contract negotiators may not get the best contract pricing due to purchases made outside of contracts.
- Vendors are unaware of WSDOT's inventory demands.

f. Cost Recovery and Tracking

- The current system is not capable of tracking items under warranty, so returned-for-repair item costs are difficult to recover.
- The current system cannot track returned or used items separately from new. As a work-around, used items must be assigned a different commodity code. Returned, serviceable items are valued at $0 and returned to stock along with unused (new) item so as not to deflate the value of all on-hand items for a particular commodity. Used items must be kept separate from new, as they are charged out at a different rate than new.
- The current system cannot track items used by an individual.
- The current system cannot associate a work order number to material used.
- The current system cannot track returned stock by vendor in order to identify vendors that supply defective items or items that have a high cost of ownership (need a lot of servicing).

g. Health and Safety, Liability

The current system cannot track lot numbers and expiration dates on inventory items. This means that commodities can become obsolete before being used.

- Liability risks are introduced if expired pesticides and herbicides are used.
- Recalled items are difficult to recover. For example, DSHS can have a life-threatening situation if bypass tubes of a particular lot number, implanted in patients or stored within their hospitals, have been recalled but cannot be found.

As seen in the direct buy chart above, large amounts of material are not recorded into inventory. In addition, issues of stock from inventory are not associated with a specific work order or project. By not having a tie between WSDOT's services and material usage, WSDOT is more vulnerable to liability charges. For example, a road crew may mix and distribute deicer on a roadway to clear it of ice. If an accident occurs, WSDOT must prove the road was cleared and that the proper deicing agents were applied. This requires a tie to work performed and material used.

h. Business Controls

The current inventory management environment lacks the following controls:

- **Inventory Controls.** The current system does not tie material usage to maintenance work. For example, 10 items may be pulled from stock and only 2 used. There is no record of who took the items.
- **System Security.** Any user can do almost anything within the current system. There is no security based on a user's organization, occupation, authority, etc. A user in one region may record inventory transactions for another region. Another risk is that an employee could enter an inventory adjustment into the system. Without a specific effort by the information technology support team to access the particular file and extract the information, the system cannot tell who made the adjustment, when it was made, or why it was made,.
- **Cost Details.** There is no visibility to overhead, freight, surcharges, and discounts. Inventory managers and purchasing staff cannot plan purchases to reduce vendor charges or take advantage of vendor discounts. By having this information for each vendor and commodity, contract managers could use it to negotiate lower freight rates with vendors. Visibility to overhead and surcharge amounts would give inventory managers information on the true cost of the inventory and would support decisions to streamline the costs to process and maintain the inventory.
- **Expense Details.** There is no visibility to detail behind inventory write-offs or inventory losses. Inventory managers must understand the reason behind each inventory write-off. This information will assist managers in determining if more cycle counts are needed or if changes should be made on commodity purchases.

E. Overview of High Value Commodities

This section presents specific inventory management opportunities related to some of WSDOT's highest valued commodities, such as guardrail, deicer, sand, pesticides, herbicides, and paint.

1. Guardrail

WSDOT currently has about $650,000 in recorded guardrail inventory on hand. WSDOT inventory records indicate usage of about $1.2 million in FY04 with about $27,000 in inventory adjustments.

The following example highlights improvement opportunities related to guardrail. This past year, a particular region made 26 orders to buy $30,000 worth of guardrail outside of mandatory state contracts and issued from inventory about $80,000 in

guardrail. The guardrail bought outside of contracts was never recorded into inventory and therefore the usage of this guardrail was not tracked. In addition, only 2 of the 26 orders met the minimum purchase level required to avoid additional freight charges. This means the other 24 orders had freight charges added. Many times the freight charges of these orders exceed the cost of the items ordered. The current inventory system does not track freight separately. Therefore, management has no visibility to the actual cost of material shipments.

The following photos show how various sites have stored guardrail.

This photo shows guardrail that is somewhat organized and marked.

This photo shows no marking and a scattering of components in the yard. At this site, it would be difficult to determine an accurate inventory status.

This photo shows an example of excellent guardrail management. The guardrail is marked, organized vertically to conserve on storage requirements, and properly stored. A physical inventory count would take very little time.

The photo on the left shows guardrail that was destroyed by a motorist. The photo on the right shows the repaired guardrail.

The current inventory system cannot provide information to management as to which material was needed to make this repair, how much it cost, and whether it was available at the time it was needed.

The posts supporting the guardrail are not procured on a state contract. Each order is charged freight unless it is added onto a contract order greater than $2,000. Freight charges are part of the value of the inventory, but are not tracked separately. This means inventory managers cannot tell if they are incurring unreasonable freight charges.

All of these guardrail parts (posts, bolts, rails, and extenders) are part of a system that needs to be tracked. If any parts of this system are missing, it requires separate orders, which incur freight charges, to complete the system. The inventory system needs to be able to track guardrail system components and proactively maintain part levels in such a way as to reduce freight and meet minimum buy levels.

2. Deicer

As of June 2004, WSDOT's inventory records reported over $550,000 of deicer in stock with $4.5 million issued (excludes the Olympic region) and $23,000 in inventory adjustments. The numbers only reflect deicer that was recorded in inventory.

The following photos show deicing chemicals being applied to an icy road.

To prevent accidents and reduce the liability to WSDOT, it is important that deicing materials are applied properly and that the formula used matches the road conditions. WSDOT buys between $6 million and $8 million of deicing material each fiscal year.

Deicer comes in both liquid and solid configurations. Currently, there is not sufficient storage for the liquid deicer to meet peak demand; therefore, the liquid deicer stock depends on timely deliveries. Deliveries may be difficult to receive during severe winter weather. WSDOT would like a system that can understand usage levels and has an accurate view of inventory levels, locations, and expected delivery dates. For example, if a maintenance superintendent knew about a delivery of deicer to a particular location, he could reroute the delivery if a snowstorm hit in another area.

This photo shows liquid deicer stores being maintained off season. This deicer must be continuously agitated to remain usable. This maintenance activity increases inventory overhead costs and diverts resources from more seasonal activities.

3. Sand

The following photos show that there are costs associated with inventory. Inventory requires storage, equipment (conveyor belt), management, and maintenance resources.

The photo on the left shows the importance of matching storage capabilities to inventory levels. The purpose of the shed is to keep the sand dry, yet this photo shows that not all of the sand is protected. Wet sand applied to the road could introduce a liability issue. It also skews the conversion of receiving quantity to issue quantities as wet sand converts differently from dry sand.

The following photos show unsheltered, deteriorating stockpiles of sand. WSDOT still uses sand, although there is an increasing trend to use deicer.

4. Pesticides and Herbicides

WSDOT spends an enormous amount of money on herbicides and pesticides. WSDOT uses $1.6 million in these chemical products per year. There is about $700,000 on hand and the inventory turns at a rate of 2.3 turns per year with an average cost of $2.3 million. There was about $75,000 of inventory write-offs the past two years.

This inventory must be tightly controlled, managed, and tracked as it carries a risk to public safety.

The following photos show an organized and secure chemical warehouse, yet a few problems exist.

The current system does not convert from gallons received to ounces issued. This must be done manually. The current system only recognizes one unit of measure and it does not check the user's math. In addition, the system only takes whole units of measure.

Commodity codes for these chemicals all end in "000," which increases the chance of pulling the wrong chemical. Bar coding these commodities could greatly reduce the probability of pulling the wrong chemical. The current system cannot support tools such as barcode readers and scanners.

Loss of chemical inventories means its usage was not tracked. This translates into a liability issue for WSDOT, as it must legally account for all pesticide and herbicide usage.

5. Paint

The current recorded on-hand value for paint is $357,000 with $2.9 million issued and a turn rate of eight. During the past year, $28,000 in inventory adjustments were recorded.

Paint commodities require special storage. The following picture shows metal paint containers of water-based paint stacked outside on the afternoon sunny side of the building in July. Anything water based should be kept at or near room temperature to prevent evaporation or freezing.

All of the totes look alike, yet each may hold a different type of paint. This commodity would also be a good candidate for bar coding, since the totes come labeled.

Once the totes are emptied, they have to be returned to the vendor to be refilled. If the totes are not returned then the resupply process can be disrupted. For example, a Texas vendor was out of totes and had to fill orders for a competing customer. WSDOT did not supply the vendor with a good usage forecast, so the vendor was unprepared to respond to WSDOT's demands.

WSDOT also pays premium freight if the paint totes are not ordered by the truckload.

II. Needs Assessment

■

A. Overview

The Needs Assessment chapter documents WSDOT's business requirements for a consumable inventory system solution. This chapter presents findings by Dye Management Group, Inc. developed through the following:

- Interviews with key executives and managers.
- Visits to WSDOT maintenance areas.
- Visits to DSHS hospital and DOC prison inventory control points.
- A series of focus group meetings involving inventory management and finance staff from across the state.
- Analysis performed by Dye Management Group, Inc. consultants.

B. Approach

To develop the consumable inventory needs, focus group sessions were held with various inventory management work teams representing accounting, stores, maintenance, and enterprise functions. These focus groups were organized with the assistance of WSDOT and the ECIT. The focus groups covered a range of consumable inventory management functions and were grouped as follows:

- Stores
- Maintenance
- Accounting
- ECIT

The first set of focus group sessions, held in March 2004, worked to identify and describe WSDOT's key consumable inventory issues and needs. Opportunities to improve upon processes, systems, services, and information provided by the current environment were documented.

Focus group sessions with the ECIT, held in April 2004 and May 2004, reviewed the findings of the first focus group sessions and defined WSDOT's consumable inventory requirements.

By developing these consumable inventory management requirements in coordination with the ECIT, the resulting requirements reflect the core needs of WSDOT as well as those of the ECIT's participating agencies such as DSHS and DOC.

In addition, management and staff from the following departments were also interviewed to determine department-specific consumable inventory needs:

- Washington State Department of Transportation (WSDOT).
- Department of Social and Health Services (DSHS).
- Department of Corrections (DOC).

C. Requirements

This section lists the business requirements as defined by WSDOT's management, focus groups, department representatives, and the ECIT.

The chosen technical solution must provide a modern, usable, flexible, effective, and efficient means to manage consumable inventory. By developing these consumable inventory management requirements in coordination with the ECIT, the resulting requirements reflect the core needs of WSDOT as well as those of the ECIT's participating agencies such as DSHS and DOC.

As inventory management is just one function in the consumable supply chain, the team identified requirements that meet the needs of the supply chain, but could not be identified as specific "inventory management" requirements. These requirements span purchasing, vendor, contract, material, and warehouse management. These requirements have been identified as out of scope for this project and given a priority level of L = Low. Yet, in the context of an integrated supply chain, these requirements are a high priority.

1. Requirement Matrix

In addition to a brief description, the information provided for each requirement includes the following:

The "PR" column identifies the requirement's priority rating. The ECIT determined the priority ranking for each requirement. The priority ranking values are defined in Exhibit II-1.

Exhibit II-1: Priority Definitions

PR Rank	Meaning	Definition
H	HIGH	A priority of high identifies mandatory or critical business needs. The chosen solution must fulfill these needs.
M	MEDIUM	A priority of medium identifies requirements that are important but are optional. A medium ranking would not prevent selection of a chosen solution if that solution could not fulfill the requirement.
L	LOW	A priority of low identifies a requirement that meets one of the following criteria: • The ECIT believed the requirement was not an important need but rather a "nice to have" capability. OR • The requirement was out of scope. That is to say, it would facilitate the supply chain process, but was not specifically an inventory management function.

The "CC" column identifies whether the current system is capable of meeting the requirement. Exhibit II-2 defines the value for the current capabilities ranking.

Exhibit II-2: Current Capability Definitions

CC Rank	Meaning	Definition
2	Capable	The current system capabilities meet the requirement.
1	Partly Capable	The current system partially satisfies the requirement.
0	Not Capable	The current system cannot satisfy the requirement.

Note: Many of these requirements reference "Use Cases." These "Use Cases" are available for review in Appendix C. Prior to this study; these "Use Cases" were developed by the ECIT to illustrate desired system use scenarios for the new system. The intent of the "Use Cases" is what is important. The ECIT understands that the

specific scenario might change, depending on the capabilities and usability features of the chosen solution.

2. Requirements

a. Accounting

No.	PR	CC	Requirement	Notes
1.1.0 Accounting				
1	H	1	Solution fully integrates with financial management processes and systems.	
2	H	0	Ability to ensure accuracy of financial information.	
3	H	0	Transactions reflect the same fiscal period as finance systems.	
4	H	1	Inventory transaction reports contain detail that supports transactions posted by the finance systems.	
5	H	2	Ability to look at transaction history by commodity.	DSHS history is limited to 3 months
6	H	1	Expenditure coding included in history for issue transactions.	DSHS ranks the CC as 1 DOC and GA rank the CC as 2
7	H	0	Ability to make corrections, which leave a clear, easily viewed audit trail.	
8	H	0	Ability to easily make price adjustments to inventory cost (currently done by a payable review).	DSHS ranks the CC as 2 DSHS and DOC can do this, but there is no audit trail. Can run an adjustment +/- report.
9	H	0	Synchronized vendor information with financial systems.	This is a manual process for DSHS. In addition, there is a GA initiative to key vendor information on FEIN.
10	H	0	Ability to process a month 99 (for mid-biennium adjustments) and a month 25 (for end of biennium adjustments).	
11	H	0	Synchronized and current organization and accounting information with financial systems.	
12	H	0	Ability to communicate daily inventory transactions to the finance system.	
13	H	0	Ability to reflect/communicate corrections posting in financial systems back to the inventory system.	
14	M	0	Ability to record fair market value of inventory and track for the CAFR report.	

No.	PR	CC	Requirement	Notes
1.2.0 Reconciliations				
15	M	1	To reduce reconciliation efforts, input errors must be prevented through automated edits.	DSHS ranks this PR as H GA ranks the CC as 0 DSHS has 2 systems to reconcile. This is done annually. Since the GL only carries totals, it is difficult to do detailed reconciliations. They end up being an adjustment to physical inventory at end of the year.
16	M	0	Calculations of unit price should prevent rounding errors. (There needs to be at least 4 decimal places.)	DSHS PO's round to 2 digits yet the average price goes out 4 decimal places. Large volume items like deicer and pesticides get broken down quite a bit on issue. When receiving the current DOT system wants whole numbers, decimals places cause problems.
1.3.0 Accounting Use Cases - This "Use Case" is available for review in Appendix C.				
17	H	1	Adherence through best practices to Accounting Use Case 1: Payment for Consumable Inventory Purchase Order.	

b. Operations

No.	PR	CC	Requirement	Notes
2.1.0 Purchasing / Ordering				
1	H	0	Eliminate the use of forms. Allow for one time entry of field order or purchase card order into the system.	
2	L	0	To reduce time faxing orders, automate communication of order to vendors. Provide e-mail or other electronic means to submit orders to vendors.	Need to send requisition to purchasing system and get feedback on order/PO#. (Would want to integrate purchasing function in the future). Consumable Inventory system must integrate with purchasing system(s).

No.	PR	CC	Requirement	Notes
3	H	1	Ability to prompt purchase managers to reorder when inventory reaches a minimum reorder level.	
4	H	1	Ability to calculate automatically on-hand needs based on usage history.	
5	H	0	Critical item management – Ability to calculate safety stocks, based on historical demands.	
6	H	0	Ability to order for a specific project, such that the inventory would be reserved at the ICP for the indicated project.	
7	L	0	Currently, all field order forms must be approved (signed). Would rather have authority to release orders in the system to save time and effort. This would require specific approval level security within the system.	This requirement **OUT of SCOPE** for inventory but a high priority for purchasing.
8	L	0	Have contract information integrated with the ordering process, so that orders reflect correct pricing and discounts.	This requirement **OUT of SCOPE** for inventory but a high priority for purchasing.
9	L	0	Have contract information come up based on terms of contract. System should help establish payment due date and discounts.	This requirement **OUT of SCOPE** for inventory but a high priority for purchasing.
10	H	0	Need to be able to change a field order after receipt without having to back it out.	
11	H	0	Identification of obsolete commodities and prevention of orders against these obsolete commodities.	
12	H	1	Ability to view inventory at all organization levels, facilities, ICPs, stocking locations, bins, etc.	
13	L	0	Ability to do online purchasing from vendors with ability to communicate order/invoice to financial services.	This requirement **OUT of SCOPE** for inventory but a high priority for purchasing.
14	L	0	Ability to enter an order for more than one ICP at a time. Need to have multiple location capabilities, e.g., POs with multiple ship-to addresses.	This requirement **OUT of SCOPE** for inventory but a high priority for purchasing.

No.	PR	CC	Requirement	Notes
15	H	0	Ability to interface with the purchasing system, so that purchase requests are submitted from the inventory system to the purchasing system for approval and assignment of a purchase order number. Currently, double entry is done between the purchase system and the consumable inventory system. Orders are entered into the inventory system to create a purchase request; information is then entered into the purchase system to get purchase order number, and then back to inventory system to update the purchase requisition with the PO number. Receiving information is never fed back to the purchasing system.	
2.2.1 Purchase Cards				
16	L	2	Ability to use purchase cards when ordering or buying direct consumables.	This requirement **OUT of SCOPE** for inventory but a high priority for purchasing.
17	L	0	Assistance for those using purchase cards to understand what items are on contract with a specific vendor. This will prevent consumables from being purchased outside contracts.	This requirement **OUT of SCOPE** for inventory but a high priority for purchasing.
2.2.0 Receiving				
18	H	1	Ability to receive partial orders efficiently.	
19	H	0	Ability to scan incoming and count to verify quantity delivered.	
20	H	0	Automatic compare of receipt to the purchase order with the ability to correct discrepancies easily.	
21	H	0	Ability to receive in partial units not just whole units. Need at least 4 decimal places. (Deicer shipped in tons, convert to gallons)	
22	H	0	Ability to receive against a multi-location ship to purchase order.	
23	H	0	Capability to use scanning tools to assist with receiving, issuing, and physical inventory.	
24	H Duplicate	0	Ability for modifications at time of receipt to be reflected back on to the field order. Right now, field orders can be added after receipt, but not changed. For example: Sometimes exact price is not known until time of receipt/invoice received.	
25	H	0	Receipt problems should not hold up the receipt of goods. The system should provide methods to resolve receipt problems automatically.	
26	H	0	Ability to reject receipts with a reason code.	

No.	PR	CC	Requirement	Notes
2.3.0 Issues				
27	H	1	Ability to change an issue previously recorded in the system.	
28	H	0	Ability to adjust an overcharge in the system without skewing unit price of inventory. For example: It is difficult to correctly gauge sand going out. That is, how many cubic yards were loaded on a dump truck?	
29	H	1	System needs to accept/communicate usage and work order data from maintenance management system, e.g., Ability to record and track pesticide or other hazardous material usage or interface to the Pesticide FileMaker Pro system. Tracking pesticide usage is a state regulation. Would like the inventory system to handle this, and then obsolete the use of the Pesticide FileMaker Pro system.	
30	H	0	Opportunity to use best practices, so that inventory is not issued without being recorded in the system. The physical issue of inventory and the recording of the issue into the system must be a one-step process.	
31	H	0	Ability to do cross docking to record in and immediate out of inventory.	
32	H	1	Ability to charge out inventory to work order # or job # with validation.	
33	H	0 DOC 2	Ability to issue inventory to multiple organization codes.	
34	M	0	Ability to track and allow charge out of mixtures (salt and sand, deicer), rather than keep as separate inventory items.	
2.4.0 Physical Inventory				
35	H	1	In order to speed up research and reconciliation of physical inventory discrepancies, require easily accessible online history of all inventory activities.	
36	H	1	Automated assistance with physical inventory and cycle counts.	
37	H	0	Ability to use bar coding and scanners to do cycle counts.	
38	H	2	Ability to perform physical inventory at appropriate time of year.	

No.	PR	CC	Requirement	Notes
2.5.0 Vendors / Payments				
39	H	0	Ability to keep vendor information synchronized with AFRS and TRAINS financial systems or with new GA WEBS system.	
40	M	1	Ability to track online all orders, receipts, commodity history, etc. for a particular vendor. Notes: For WSDOT, Information is in the data mart, but not accessible in the current inventory system. For DSHS, this information is not easily accessible.	
41	H	0	Ability to track/record vendor performance.	
42	H	1	Ability to collect vendor information easily to assist with performance based contract negotiations and management.	
43	L	0	Ability to communicate electronically with vendors.	
44	H	0	Ability to view, update items such as shipping, discounts, surcharges, sales tax, etc.	
45	H	0	Ability for system to make adjustments from order all the way through to the vendor payment.	
46	L	0	Ability to receive electronic invoices (instead of faxes) from vendors at time of shipment.	
47	M	0	Ability to generate a payment request (originate payment in the inventory system) and communicate it to the appropriate accounting system (TRAINS or AFRS). Inventory users would have access to the inventory part or system, accounting users would have access to payment part of system (separation of duties).	
2.6.0 Commodities				
48	H	0	Provide for an expanded commodity description. Note: DOC can provide a description.	
49	H	1	General Administration sets up commodities. Need the ability to overwrite/refine commodity descriptions.	WSDOT has people that work with GA to set up commodities. If a region expands a description, then only that region should be able to view/use that description. That is, regions need the ability to add local information to the master information. DSHS would like to expand the GA description and add in notes.

No.	PR	CC	Requirement	Notes
50	H	1	Ability to set up temporary commodity codes with ability to change automatically over to the permanent commodity code (to get temporary # off orders, history, etc.). Need crosswalk or history for commodity to show temporary numbers assigned.	
51	L	0	Provide an opportunity to implement best practices in tracking commodities and items.	The state is interested in using a method other than state defined commodity codes to track inventory.
52	H	0	Ability to use manufacturer's serial code and bar coding capabilities with a cross walk to commodity code.	
53	H	0	When charging out a commodity code, need visibility to commodity description, to prevent charging out the wrong commodity.	
54	H	0	Ability to expand commodity code and provide more descriptive fields.	Current commodity code is number. Need an alphanumeric code with more than 10 characters. Currently there is a limited "alias" field to accommodate manufacturer's #.
55	H	2	Ability to tie commodity codes to location(s).	
2.7.0 Conversions				
56	H	1	In order to prevent incorrect recording of units, need the ability to convert automatically order units, received units and issue units.	DOC ranks CC as 2
57	H	1	Ability to prevent order quantity and receipt/issue quantity discrepancies. For example, the current system will allow order unit = 1 gallon, receive unit = 12 ounces (only a warning message appears).	
2.8.0 Other Inventory Operations				
58	H	0	Ability to provide basic warehouse management functions, such as stocking locations within each warehouse by type of inventory, usage, size, etc.	
59	H	0	Ability for the system to track and value "cores" inventory.	
60	H	0	Ability to accept return of used commodities back into inventory, valued differently from new.	
61	H	0	Ability to identify and pull from used/return/rebuilt stock before pulling new.	
62	H	0	Ability to track and value repaired inventory.	

No.	PR	CC	Requirement	Notes
63	H	0	Ability to track and value rebuilt inventory (valued differently)	
64	L	0	Ability to process an inspection step when receiving used or returned items back into inventory.	
65	H	1	Ability to identify and a means to dispose of obsolete inventory.	
66	L	0	To facilitate quick issue/pick of inventory, automated recommendations on relocation of warehouse items based on usage.	
67	H	1	Ability to locate items in the ICP (stocking location, bin, etc.) for all warehouse activities.	
68	H	0	Ability to track shelf life of items.	
69	H	0	Ability to track and value kits.	
70	H	0	Ability to provide build-logic for kits.	
71	M	0	Ability to disassemble kits, with components put back into inventory.	
72	H	1	Ability to charge inventory offsets to a specific fund or location.	
73	L	0	Ability to track warranties for items so that, if an item is returned for repair, one can tell if it is under warranty.	On some contracts, we are a reseller. In this case, the warranty does not take effect until items are issued out/consumed.
2.9.0 Operation Use Cases - These “Use Cases” are available for review in Appendix C.				
			Adherence through best practices to the following:	
74	H	1	Use Case 1: Administer Master Records.	
75	H	1	Use Case 2: Administer Detail / Warehouse Records.	
76	H	1	Use Case 3: Initiate an Order.	
77	H	1	Use Case 4: Receive Item / Locate where to store item.	
78	H	1	Use Case 5: Issue / Request (Create pick ticket).	
79	H	1	Use Case 6: Issue / Fill Request.	
80	H	1	Use Case 7: Transfers.	
81	H	1	Use Case 8: Returns to Stock	
82	H	1	Use Case 9: Donated Inventory	
83	H	1	Use Case 10: Vendor Return	
84	H	1	Use Case 11: Defective / Outdated Reductions	
85	H	0	Use Case 12: Kits	
86	H	1	Use Case 13: Physical Inventory	

c. Information

No.	PR	CC	Requirement	Notes
3.1.0 Information				
1	H	0	Real-time visibility for all inventory information including inventory value and pending activities.	
2	M	0	Ability to provide a negative sales report in order to tell if issued or sold items were not in inventory (items that were never recorded in the inventory).	
3	H	2	Visibility to late orders. That is, orders should have been received / delivered based on an estimated delivery date.	
4	H	1	Visibility to stock availability, at time of issue.	
5	H	1	Visibility to purchase orders that have been received, but not paid.	
6	H	0	Ability to provide supervisors all daily activity by users within an ICP.	
7	H	1	Visibility to usage information, as well as when the inventory was used.	
8	H	1	Visibility to historical usage of commodities for any date range (for example, prior and current calendar years, biennium, and fiscal years.)	
9	H	2	Ability to allow for the sale of inventory to external entities.	
10	M	0	Visibility to inventory used/consumed versus inventory sold or donated. For example: a WSDOT maintenance area may sell deicer to a city or county.	
11	H	0	Ability to provide for online query into inventory information.	
12	H	0	Ability to “drill down” to see detail behind all inventory activities.	
13	H	2	Ability to generate a Transaction History Report that reports all inventory activities and transactions.	
14	H	2	Ability to generate an Order Report that reports status and activity of orders (pending, filled, partially filled, etc.)	
15	H	1	Ability to generate an Issue and Returns Activity Report that reports information on all issues of stock or returns to stock. This will be used by finance to verify third party billings or billings to specific charge codes.	
16	H	1	Ability to generate a Vendor History Report that reports on vendor performance for commodities. This includes generated details of vendor performance, as well as other details and comments recorded by users.	

No.	PR	CC	Requirement	Notes
17	H	0	Ability to generate an Expiration Report that reports items, quantities, and lots due to expire or expired based on expiration date.	
18	H	1	Ability to generate an Inventory Status Report that reflects current condition of inventory including quantity on hand, order point, order quantity, on order, usage, and other information needed to effectively manage inventory and make educated decisions about replenishment, transfer, and disposal.	
19	H	1	Ability to generate a Stores Payable Report that is used by accounting staff for audit verification of dollar amounts paid to vendors to amounts recorded in inventory.	
20	H	1	Ability to generate a Physical Inventory Report that identifies items due to be counted in a preferred order. For example, the preferred order might be the order which items are physically stocked in a warehouse.	
21	H	1	Ability to generate reports to facilitate cycle counting where the system drives what to count.	

d. Management

No.	PR	CC	Requirement	Notes
4.1.0 Management Use Cases - These "Use Cases" are available for review in Appendix C.				
			Adherence through best practices to the following:	
1	H	1	Use Case A: Track Maximum Dollar Level. Intent is to know how many non-cash assets are liabilities by showing dollar value of inventory on hand.	
2	H	0	Use Case B: Calculate Turn Rate. Intent is to measure the efficiency of the supply chain by showing the frequency of issues versus level of stock.	
3	H	1	Use Case C: Calculate Surplus Summary. Intent is to recognize surplus inventory in order to manage it by showing the dollar value and quantity of items on surplus inventory by location.	
4	H	0	Use Case D: Track Usage, Forecast by Office and by Work Crew. Intent is to manage the flow of operational materials. Can be used for cost control through more efficient contracting.	

No.	PR	CC	Requirement	Notes
5	H	1	Use Case E: Track Adjustments. Intent is to show accuracy and inefficiencies of inventory usage. Can be used for forecasting and operations improvements.	
6	H	1	Use Case F: Identify Surplus Items. Intent is to find an alternative use or disposition of surplus items.	
7	H	0	Use Case G: Analyze Vendor Performance. Intent is to verify vendor reliability and value to facilitate vendor contract negotiations and relationships.	
8	H	0	Use Case H: Track Vendor Tables. Intent is to catalog vendor information by maintaining up-to-date vendor, contract, performance standards, payment terms, order history and other relevant information.	
9	H	1	Use Case I: Track Delivery History. Intent is to track receiving efficiency and vendor performance by tracking order date, estimated versus actual delivery dates, partial deliveries, backorders, quantity ordered versus received.	
10	H	1	Use Case J: Open Orders. Intent is to have an overview of obligations and unfulfilled orders at a point of time in order to manage cash flow.	
11	H	0	Use Case K: Stale / Expired Stock. Intent is to provide visibility to items and lots on hand that have or soon will exceeded their expiration dates or items that have been in stock without usage for a set period.	
12	H	0	Use Case L: Receipt - Stock Time. Intent is to provide visibility of the time it takes to move an item into stock after it has been received.	
13	H	0	Use Case M: Temporary Storage Report.	
14	H	0	Use Case N: Distribution Cost Analysis.	
15	H	2	Use Case O: Re-order Report. Intent is to provide information about which items should be considered for re-ordered based on actual or projected on-hand minimum levels.	
16	H	0	Use Case P: ABC Analysis. Intent is to establish management priorities by determining the “80/20” relationships between various items.	

No.	PR	CC	Requirement	Notes
17	H	1	Use Case Q: Hazardous Materials Report. Intent is to identify and track known hazardous material in inventory.	
18	H	1	Use Case R: Order History by Vendor. Intent is to provide detailed history of transactions with particular vendors with the ability to give a trend view of price changes, usage, performance, etc.	

e. Controls

No.	PR	CC	Requirement	Notes
5.1.0 Controls				
1	H	1	Ability to provide an audit trail of all activity. This includes identifying those responsible for the action and the date the action took place.	
2	H	0	Ability to secure activities based on employee's organization, location, authority levels, role, activity, field, etc.	
3	H	0	Ability to provide for field and screen level authority (no access, view only, update, delete, etc.)	
4	H	0	Ability to perform electronic approvals.	
5	M	0	Ability to provide workflow capabilities, so that documents may be automatically forwarded for approval and processing.	

f. Usability and Integration

No.	PR	CC	Requirement	Notes
6.1.0 Usability and Integration				
1	H	1	Automatic verification of the most critical information entered and processed.	
2	H	0	Based on user and data entered, ability to default field values or present customized field entry lists.	
3	H	0	Elimination of duplicate entry by integrating/sharing information from one activity to another.	

No.	PR	CC	Requirement	Notes
4	H	0	Simplified processes for staff to record and track inventory activities and supporting information thus giving staff the ability to maintain accurate and useful inventory information.	
5	H	0	Greatly reduce the need for forms.	
6	H	0	Real-time processing of all inventory activity (with the exception of some interfaces).	
7	H	1	Ability to integrate fully with existing or future purchasing, finance, PDA maintenance systems.	
8	H	0	Elimination of duplicate entry of information.	
9	H	0	Require agency specific configuration of system.	

III. Description of Alternatives

■

A. Overview

This section describes each of the three major alternatives examined for replacement of the Department of Transportation's Consumable Inventory system.

The following alternatives were evaluated in preparing this feasibility study:

- Alternative 1 – Custom Development
- Alternative 2 – Best of Breed Package
- Alternative 3 – ERP Package (SAP)

The primary focus of this evaluation was determining the most advantageous functional, technical, and financial approach for the Department of Transportation to replace its Consumable Inventory system. However, in conformity with the Office of Financial Management's Blueprint for Statewide Financial Systems, and building on the work to date of the Enterprise-wide Consumable Inventory Team, the migration path to providing inventory management functionality in the future for other agencies was considered.

The following options were considered but not analyzed in detail during this study:

1. Re-Host Existing System

Under this alternative, the current system would be moved from the current mainframe environment into a Windows-based environment server. This could make the system somewhat more user-friendly because it will provide access using a Windows graphical user interface. However, there would be no improvements in business functionality available to users. For that reason, this alternative was not examined further.

2. Modify Existing System

This alternative would include developing new capabilities within the legacy application, using the current mainframe-based technical environment. It would be expensive and time-consuming to complete the required changes because it would require use of older mainframe development tools. In addition, the current system is not well documented, and the effect of changes is unpredictable and risky. Finally, this alternative would provide no improvement in the outdated and risk-prone technical environment. Some of this risk is due to the combination of development languages

(COBOL and NATURAL) and data storage / database systems (Adabas, VSAM) used. For those reasons, this alternative was not examined further.

B. Alternative 1 – Custom Development

1. Description of Alternative

The Custom Development alternative provides for development of a custom inventory management application specifically tailored to the needs of WSDOT. A project would be organized to complete all phases of a typical system development life cycle. This work would likely be completed by a combination of WSDOT staff and contractor staff, under the direction of a state employee serving as project manager. A single contractor firm would be engaged to provide accountability for key project deliverables and enhance coordination.

2. Information Sources

This alternative was developed using the following information sources:

- WSDOT's Office of Information Technology (OIT) management and staff.
- State and vendor price lists for hardware and software. (Some products appear on special negotiated contract rates for the state, resulting in significant cost savings.)
- Dye Management Group, Inc.'s experience and intellectual capital regarding the costs and requirements for complete life cycle system development projects.

3. Technical Description

a. Hardware Requirements

Under this alternative, the application will operate within WSDOT data center. Because of the nature of the application, automatic failover capability will be provided. By providing a backup server and copy of the application, this will ensure maximum availability of the application for end users, and will avoid significant IT administrative time for maintenance.

This will require the addition of the following hardware to the data center:

- Four application servers (Xeon 3.06 GHz Dual CPU, 4 GB DDR RAM, 5X73 GB SCSI hard drive). These application servers will support BizTalk middleware as well as the new application, covering development/testing (one server), production (two servers), and secondary (one server).
- Three Web servers (Xeon 3.06 GHz Dual CPU, 8 GB DDR RAM, 5X73 GB SCSI hard drive). These Web servers will run Microsoft's Internet

Information Services (IIS). One server will be used for Development/Testing, another for production, and the third will serve as a secondary server.

- Three database servers (Xeon 3.06 GHz Dual CPU, 8 GB DDR RAM, 5X73 GB SCSI hard drive). These Web servers will run Microsoft's SQL Server database. One server will be used for Development/Testing, another for production, and the third will serve as a secondary server.

In addition to equipment required for the data center, forty bar code readers will be required for use at local inventory sites to allow for streamlined data entry.

b. Software Requirements

The following software will be required for this option:

- Windows Server Enterprise Edition, ten copies, one for each server listed under Hardware.
- SQL Server, Enterprise Edition, three copies, one for each database server.
- Microsoft Studio .NET, one copy, for use by developers in building the application.
- Crystal Reports, Enterprise Edition, one copy, for use in generating reports and graphs and for data analysis.
- ASP Mail Server, Unlimited Version, one copy, to provide automatic e-mail notification when certain events occur within the application.
- Windows Terminal Server, access for twenty clients, to allow all analysts and developers to have access to common development and database tools.
- Microsoft BizTalk Server middleware, four copies, one for each application server, for connecting this application to other applications (such as TRAINS). This will also facilitate future changes to interfaces; for example, pointing the interface to a different system.

c. Application Scope and Functionality

Under this alternative, the new Consumable Inventory system would include the following principal functions:

- Inventory Management.
- Materials Management/Master.
- Vendor Management.
- Returns Management.

- Inquiry and Reports.
- Interfaces to the current systems (TRAINS, Ferries Inventory Report System, and Minor Capital Inventory).

d. Technical Skill Sets and Training Required

Under this alternative, contractor and state staff in technical roles will require skills in the following areas:

- Data Modeling, Data Analysis, and Data Migration Mapping.
- Infrastructure Support.
- SQL Server (current version).
- The Microsoft Studio .NET tool set including the C# programming language.
- Microsoft's BizTalk middleware product.
- Crystal Reports.
- ASP Mail Server.

As state staff assumes maintenance and operations responsibilities for the application, it will be important to ensure that they have adequate training in these technologies.

4. Staffing and Organizational Impact

a. Project Staffing

Project staff for this alternative is listed in Exhibit III-1**.** For each staff role, the number of individual's hours required during the project is also listed.

Each of these roles is described in Appendix D: Staff Role Descriptions.

Exhibit III-1: Custom Development Project Roles

Role	Number	Hours
Development Contractor Roles		
Project Manager	1	1600
QA Testing Specialist	2	1760
Business Analyst	3	4320
Data Modeler	1	820
SQL Server DBA	1	700

Role	Number	Hours
Interface/Data Conversion Developer or	1	1120
Biz Talk Developer	1	1040
.NET Developer	5	4800
Documentation Specialist	1	960
Program Manager	1	320
Project Manager – Contract	1	1600
Business Analyst	3	4320
Subject Matter Expert	10	1440
Acceptance Tester	7	560
Data Modeler	1	440
SQL Server DBA	1	440
Infrastructure (Network and System) Support Person	1	1440
Interface/Data Conversion Developer	2	1440
.NET Developer	2	2240
Training Specialist	1	480
Independent Quality Assurance Contractor Roles		
Independent Quality Assurance	1	1000

b. Maintenance and Operations Staffing

Maintenance and operations staff for this alternative is listed in Exhibit III-2. For each staff role, the number of individuals and hours required for each of the first five years of system operation is also listed.

Exhibit III-2: Custom Development Maintenance and Operations Roles

Role	#	2007	2008	2009	2010	2011	Total
State Roles							
Project Manager	1	960	480	240	0	0	1680
.NET Developer	1	1920	1920	960	960	960	6720
QA Testing	1	1920	1920	960	960	960	6720
Business Analyst	1	960	480	0	0	0	1440
Subject Matter Expert	1	1920	960	960	960	960	5760
Contractor Roles							
.NET Developer	1	1920	1920	960	480	0	5280

c. Organizational Impact

It is expected that some of the roles required during the project period, including maintenance and operations, would be assigned from among current DOT staff. This includes both technical roles (SQL Server DBA, Data Modeler, .NET Developer, Interface, and Data Conversion Developer) and non-technical roles (Business Analyst, Subject Matter Experts, Acceptance Testers). In some cases, this may require additional hiring, or back-fill assignments, to ensure that work currently being performed is covered during the project period.

5. Estimated Schedule

Under this alternative, the project would be completed between July 2005 and September 2006. It is expected to take 3 months to complete the RFP process, so the project start date is estimated to be October 2005. The estimated phased schedule for the project is described in Exhibit III-3. This schedule includes a 20 percent schedule contingency.

Exhibit III-3: Custom Development Project Schedule of Phases

Phase	Begin Date	End Date
Project Initiation	10/01/05	11/15/05
Requirements and Design	11/16/05	02/28/06
System Development	02/01/06	06/30/06
Testing and Customer Acceptance	06/01/06	07/31/06
Training and Implementation	08/01/06	09/30/06
"Go-live"	n/a	09/30/06

C. Alternative 2 – Best of Breed Package

1. Description of Alternative

The Best of Breed Package alternative provides for implementation of a third-party consumable inventory software package. This would include integration and customization of the package to fit WSDOT's needs and within WSDOT's technical environment. Customization would be kept to a minimum in order to avoid significant changes to the application, and retesting, whenever a new release is provided by the vendor. Integration would include interfaces required within WSDOT business and technical environment. This work would be completed by a combination of WSDOT staff and vendor staff, under the direction of a state employee serving as project manager. In addition, an integrator firm, which is experienced in implementing best of breed inventory and warehouse management functionality, would be engaged to ensure accountability for product implementation on time and within budget.

2. Information Sources

This alternative was developing using the following information sources:

- WSDOT's Office of Information Technology (OIT) management and staff.
- "Best of breed" warehouse and inventory management software package vendors, including the following companies:
  - i2 of Dallas, Texas.
  - Intek Integration Technologies, Inc. of Bellevue, Washington.
  - Manhattan Associates of Atlanta, Georgia.

- Dye Management Group, Inc.'s experience and intellectual capital regarding the costs and requirements for complete life cycle system development third-party package implementation projects.

Because of the diversity of solutions available from the vendors identified above, for purposes of cost, benefit, and risk comparison of this alternative to others, the most robust approach was chosen for description and analysis. This generally aligned with the solution provided by i2.

3. Technical Description

a. Hardware Requirements

Under this alternative, the application will operate within WSDOT data center. Because of the nature of the application, automatic failover capability will be provided. By providing a backup server and copy of the application, this will ensure maximum availability of the application for end users, and will avoid significant IT administrative time for maintenance.

Based on general information provided by third party vendors, it is assumed that the following hardware will be added to the data center:

- Two application servers (Xeon 3.06 GHz Dual CPU, 4 GB DDR RAM, 5X73 GB SCSI hard drive). These application servers include one production server, and a secondary server to support a redundancy and failover capability.
- Two Web servers (Xeon 3.06 GHz Dual CPU, 8 GB DDR RAM, 5X73 GB SCSI hard drive). These Web servers will run Microsoft's Internet Information Services (IIS). One server will be used for production, and the second will serve as a secondary server.
- Two database servers (Xeon 3.06 GHz Dual CPU, 8 GB DDR RAM, 5X73 GB SCSI hard drive). These Web servers will run Microsoft's SQL Server database. One server will be used for production, and the second will serve as a secondary server.

In addition to equipment required for the data center, it is assumed that 40 bar code readers and 40 barcode printers will be used at local inventory sites to allow for streamlined data entry and inventory processing.

b. Software Requirements

In addition to the application software provided by the vendor, the following software will be required for this option:

- Windows Server Enterprise Edition, six copies, one for each server listed under Hardware.
- SQL Server or DB2 DBMS, Enterprise Edition, two copies, one for each database server.

c. Application Scope and Functionality

Under this alternative, the new Consumable Inventory system would include the following principal functions:

- Inventory Management.
- Materials Management/Master.
- Vendor Management.
- Returns Management.
- Inquiry and Reports.
- Interfaces to the current systems (TRAINS, Ferries Inventory Report System, and Minor Capital Inventory).

In addition, the package will include an integration adaptor to facilitate future integration of this system with the planned statewide framework for financial and administrative systems.

d. Technical Skill Sets and Training Required

Under this alternative, contractor and state staff in business analyst and technical roles will require skills in the following areas:

- Data Modeling, Data Analysis, and Data Migration Mapping.
- Business Process Analysis and Redesign.
- Infrastructure Support.
- SQL Server (current version).
- The Microsoft Studio .NET tool set, including the C# programming language (for building system interfaces).

As state staff assumes maintenance and operations responsibilities for the application, it will be important to ensure that they have adequate training in these skills and technologies.

4. Staffing and Organizational Impact

a. Project Staffing

Project hours for this alternative are based on total cost estimates provided by best of breed vendors, and were not provided at the individual role level by all vendors. However, a set of project roles and approximate hours allocated to each are described in Exhibit III-4**.**

Each of these roles is described in Appendix D: Staff Role Descriptions.

Exhibit III-4: Best of Breed Project Roles

Role	Number	Hours
Vendor Staff		
Project Manager	1	400
Implementation Services Specialist	1	1500
Training Specialist	1	400
Warehouse Consultant	1	400
Hardware Integration Specialist	1	300
State Staff		
Program Manager	1	240
Project Manager	1	1200
Business Analyst	1	400
Data Modeler	1	440
Infrastructure (Network and System) Support Person	1	520
Interface/Data Conversion Developer	1	1600
Training Specialist	1	480
Subject Matter Expert (Warehouse Managers)	10	1100
Acceptance Tester	7	560
SQL Server or DB2 DBA	1	440
Integrator Staff		
Project Manager	1	1600
Business Analyst	1	1600
SQL Server or DB2 DBA	1	440
Independent Evaluator Staff		
Independent Quality Assurance	1	1000

b. Maintenance and Operations Staffing

The vendor's application maintenance and upgrade service is included in the annual maintenance fee for the package. Therefore, only state resources devoted to monitoring the application, and coordinating application and business process changes with the vendor and with the state's user community, are included in this section. Those resources are detailed in Exhibit III-5.

Exhibit III-5: Best of Breed Maintenance and Operation Roles

Role	#	2007	2008	2009	2010	2011	Total
Project Manager	1	1040	1040	1040	1040	1040	5200
Business Analyst	1	1040	1040	1040	1040	1040	5200

c. Organizational Impact

It is expected that WSDOT's staff support of its Consumable Inventory system will shift from a hands-on technical role in application maintenance to project management and business process and data analysis. This will require new skill sets, and possibly training in these areas, for staff assigned to the Consumable Inventory system.

5. Estimated Schedule

Under this alternative, the project would be completed between July 2005 and May 2006. It is expected to take 3 months to complete the RFP process, so the project start date is estimated to be October 2005. The estimated phased schedule for the project is described in Exhibit III-6**.** This schedule includes a 20 percent schedule contingency.

Exhibit III-6: Best of Breed Project Schedule of Phases

Phase	Begin Date	End Date
Project Initiation	10/01/05	10/15/05
Business Process Change and System Configuration	10/16/05	11/30/05
System Integration and Data Migration	12/01/05	02/28/06
Testing and Customer Acceptance	03/01/06	04/15/06
Training and Implementation	04/16/06	05/31/06
"go-live"	n/a	05/31/06

D. Alternative 3 – ERP Package (SAP)

1. Description of Alternative

The Enterprise Resource Planning (ERP) Package (SAP) alternative provides for implementation of the consumable inventory functionality within an ERP software package. Because the State of Washington is currently implementing the human resources functionality within SAP's ERP software suite, the description of this alternative presumes that consumable inventory support would be implemented within the SAP suite. It is further assumed that, prior to or concurrent to implementing consumable inventory functionality, finance functions such as core SAP General Ledger, Accounts Receivable, Accounts Payable, Purchasing, and Funds Management functionality will be implemented.

It is important to ensure careful coordination with the statewide financial systems framework, and to avoid impacts on the state's current human resource system implementation using SAP. Therefore, implementation of this alternative should be delayed until at least July 2006 to allow for completion of the human resources system project and for project preparations, such as selecting implementation and oversight contractors.

The required work for implementing consumable inventory would include integration and configuration of the package to fit WSDOT's needs. There will be no changes to the SAP source code in order to avoid impacts when a new release is provided by the vendor. Integration would include business process re-engineering, system configuration, and data conversion. This work would be completed by a combination of WSDOT staff and vendor staff under the direction of a state employee serving as project manager. In addition, an integrator firm would be engaged which is experienced implementing SAP inventory and warehouse management functionality to ensure accountability for product implementation on time and within budget.

2. Information Sources

Analysis of this option included developing an understanding of the SAP ERP architecture, as well as how this application would be coordinated with the current human resources implementation and future implementation of financial and other administrative systems using SAP. Information sources used to gain this understanding included:

- Office of Financial Management information technology and business managers.
- Deloitte consultants who have been engaged by OFM and DOP to develop a roadmap for implementing statewide financial systems.

- SAP functional experts and project managers.
- WSDOT executive managers who are assessing their response to the plan for statewide financial systems.

3. Technical Description

a. Hardware Requirements

The SAP human resources functionality is currently being implemented using the resources of the Department of Information Services' (DIS) data center. It is assumed that SAP financials and other functions will also be supported within the DIS data center. Adding inventory and warehouse management functionality will have no material impact on servers, disk space, or network bandwidth already established to support the SAP. So no additional servers or other data processing equipment are required to support consumable inventory under this alternative.

It is assumed that forty bar code readers and forty barcode printers will be used at local inventory sites to allow for streamlined data entry and inventory processing.

b. Software Requirements

Adding inventory and warehouse management functionality to the SAP functionality available to DOT staff will not require an additional operating system, database, or middleware software. So no additional software is required to support consumable inventory under this alternative.

c. Application Scope and Functionality

Under this alternative, the new Consumable Inventory system would include the following principal functions:

- Inventory Management.
- Materials Management/Master.
- Vendor Management.
- Returns Management.
- Inquiry and Reports.

In addition, the package will include integration with SAP's General Ledger, Accounts Receivable, Accounts Payable, Purchasing, and Funds Management functionality.

d. Technical Skill Sets and Training Required

Under this alternative, integrator and state staff will require skills in the following areas during system implementation:

- Project Management.
- Business Process Analysis.
- Data Modeling, Data Analysis, and Data Migration Mapping.
- Infrastructure Support.

Since the application will operate as part of the SAP system suite at DIS, no additional technical skills are required.

As state staff assumes operational responsibilities, it will be important to ensure that they have project management and business process analysis training and skills.

4. Staffing and Organizational Impact

a. Project Staffing

Project hours for this alternative are based on estimates for individual roles provided by SAP. In addition, roles that SAP expects the state to provide were included in its estimate. These project roles, and roles expected to be supplied by the project integration including approximate hours allocated to each, are described in Exhibit III-7.

Each of these roles is described in Appendix D: Staff Role Descriptions.

Exhibit III-7: ERP Project Roles

Role	Number	Hours
Vendor Staff		
Project Manager	1	1120
Workflow Consultant	1	800
Inventory Consultant	1	880
Materials Management Consultant	1	1120
Warehouse Consultant	1	1040
Independent Quality Assurance Staff		
Quality Assurance Consultant	1	1000

Role	Number	Hours
State Staff		
Program Manager	1	280
Project Manager	1	1120
Business Analyst	1	1120
Infrastructure (Network and System) Support Person	1	560
Legacy System Analyst	1	560
Data Modeler	1	280
Data Conversion Developer	1	1120
Data Entry (for data conversion)	1	560
Subject Matter Expert	10	1120
Training Specialist	1	480
Administrative/Documentation Support	1	1120
Acceptance Tester	7	560
Integrator Staff		
Project Manager	1	560
Business Analyst	1	1120
Data Modeler	1	560
SAP Functional Specialist	1	1120

b. Maintenance and Operations Staffing

The vendor's application maintenance and upgrade service is included in the annual maintenance fee for the package. Therefore, only state resources devoted to monitoring the application, and coordinating application and business process changes with the vendor and with the state's user community, are included in this section. Those resources are detailed in Exhibit III-8: Best of Breed Maintenance and Operations Roles.

Exhibit III-8: ERP Maintenance and Operation Roles

Role	#	2008	2009	2010	2011	2012	Total
Project Manager	1	1040	1040	1040	1040	1040	5200
Business Analyst	1	1040	1040	1040	1040	1040	5200

c. Organizational Impact

The organizational impact for this alternative is very similar to that for the Best of Breed alternative. It is expected that WSDOT's staff support of its Consumable Inventory system will shift from a hands-on technical role to project management and business process and data analysis. This will require new skill sets, and possibly training in these areas, for staff assigned to the Consumable Inventory system. It will also require careful coordination with WSDOT's financial management staff and systems, especially as SAP financials are implemented.

5. Estimated Schedule

Under this alternative, the project would begin approximately July 2006. Because of the need to coordinate with the statewide financial systems roadmap, the start date for this alternative is delayed by six months compared to the other alternatives. The estimated phased schedule for the project is described in Exhibit III-9**.** This schedule includes a 20 percent schedule contingency.

Exhibit III-9: ERP Project Schedule of Phases

Phase	Begin Date	End Date
Preparation	07/01/06	07/31/06
Blueprint	07/31/06	09/30/06
Realization	10/01/06	01/31/07
Final Preparation	02/01/07	03/15/07
Support	03/16/07	04/30/07
"go-live"	n/a	04/30/07

E. Comparison of Alternatives

In order to determine which alternative best suits WSDOT, they have been ranked by the benefits that they provide, the risks that they present, and the cost obligations that they require.

- **Benefits** – The benefits section identifies and ranks the benefits that are expected to be realized by each alternative.
- **Risk** –The specific risks and the level of risk vary with each alternative. The risk evaluation for each alternative addresses the degree to which the risk could apply to the alternative. It represents a composite evaluation of both the level of risk and the probability that the risk could occur.

- **Costs** – We have evaluated the cost of each alternative based on vendor surveys, discussions with WSDOT staff, and our experience with similar projects. We estimated both the capital improvement costs and the state's internal costs for implementation to get comparable numbers for the alternatives. We also estimated annual operating costs (maintenance, upgrades, and IT support) over a five-year period.

Using system-based criteria commonly used in similar engagements to evaluate alternative solutions, comparisons of the three alternatives were constructed. Since many of the rating categories are specific to the State of Washington and WSDOT, the ratings illustrate how the alternatives compare to each other rather than industry benchmarks.

Exhibit III-10 summarizes the comparison results.

Exhibit III-10: Benefit, Risk, and Cost Summary

Comparison	Custom Alternative	Best of Breed Alternative	SAP Alternative
Benefits	1.9	3.8	5.0
Costs	1.5	4.0	4.0
Risks	2.4	4.0	3.1
Total:	**5.8**	**11.8**	**12.1**
Average:	**1.90**	**3.90**	**4.03**

Legends:

Benefit:	**Risk:**	**Net Cost:**
1 – Does not provide benefit	1 – Assumes the most risk	1 – Highest cost (relative to other alternatives)
2 – Provides minimal benefit	2 – Assumes much risk	2 – Medium to high cost (relative to other alternatives)
3 – Provides some benefit	3 – Assumes some risk	3 – Medium cost (relative to other alternatives)
4 – Provides much benefit	4 – Assumes minimal risk	4 – Low to Medium cost (relative to other alternatives)
5 – Provides most benefit	5 – Assumes least risk	5 – Lowest cost (relative to other alternatives)

1. Benefits Comparison

In evaluating the alternatives, we assigned values to the benefits, risks, and costs associated with implementing each alternative using a scale of 1 to 5. For benefits, a 5 indicates that the alternative most strongly supports the benefit, while a 1 does not support the benefit.

The key benefits were derived from the project objectives, management interviews, state technology deployment strategies, and the business requirements ranking.

Exhibit III-11 compares the benefit rankings for the three alternatives.

Exhibit III-11: Comparison of Benefits

Category	Considerations	Custom Alternative	Best of Breed Alternative	SAP Alternative
Meets Requirements	Needs Assessment	3	4	5
Supports WSDOT Mission, Objectives	WSDOT PMM WSDOT	1	4	5
Supports Enterprise Objectives	ECIT OFM POG 11	1	4	5
Supports Technology Strategies	WSDOT OIS DIS	1	4	5
Meets Architectural Standards	WSDOT OIS DIS	5	5	5
Provides for a multi-agency solution	Common tools, software Common processes Sharing resources Common performance metrics Enterprise Reporting	2	2	5
Promotes Data Integration	Eliminates Interfaces, Data Bridges, Duplication Promotes Data Sharing	1	3	5
Promotes Data Integrity	Eliminates Forms Eliminates Duplicate Entry Reduces Reconciliation with Finance Simplifies Data Entry	1	4	5
Withstands Change	Flexible / Configurable Upgradeable Scalable Future Business Needs	2	4	5
Support Industry “Best Practices”	Continuous Research and Investment Industry User Groups Industry Customer Base	2	4	5

Category	Considerations	Custom Alternative	Best of Breed Alternative	SAP Alternative
Simplifies Technical Landscape	Obsolescence of legacy software, tools, data repositories Elimination of interfaces Elimination of duplicate data Migration to common platform	2	3	5
Supports Modern Tools & Techniques	Scanners PDAs Mobile Access Work Flow	2	5	5
Total:		**23**	**46**	**60**
Average:		**1.9**	**3.8**	**5.0**

Legend

Benefit:
1 – Does not provide benefit
2 – Provides minimal benefit
3 – Provides some benefit
4 – Provides much benefit
5 – Provides most benefit

2. Risk Comparison

Exhibit III-12 compares risk categories for the three alternatives. A rating of 5 indicates the alternative presents the least risk and a rating of 1 indicates the greatest risk of an unsuccessful implementation of the alternative.

Exhibit III-12: Comparison of Risks

Criteria	Considerations	Custom Alternative	Best of Breed Alternative	SAP Alternative
Time to implement (longer is riskier)	• Start Date • Project Duration	2	4	2
Likelihood of on-time implementation	• External Dependencies	3	5	1
Proven solution	• Similar Industry and Process Implementations • Proven Implementation and Configuration Methodology	1	5	5

Criteria	Considerations	Custom Alternative	Best of Breed Alternative	SAP Alternative
Custom development (custom is riskier)	• Amount of custom development	1	4	5
Availability of IT staffers to support system in the future	• Industry standard technologies	3	4	4
Complex Implementation	• Level of change required to processes, technologies, organization, roles, policy, etc.	5	3	1
Functional Impact on Business Processes or Rules	• Change to Business Rules • Mission critical systems replacement • Multi-agency effort • Job Training	3	2	1
Development Effort and Resources	• Resources • Time • Funding Approvals	2	4	3
Technology	• Emerging • Unproven • Training Required • Complex	2	5	5
Capability and Management	• Executive Sponsorship • Customization • Project Management • Proven Methodology	2	4	4
Total:		**24**	**40**	**31**
Average:		**2.4**	**4.0**	**3.1**

Legend

Risk:
1– Assumes the most risk
2 – Assumes much risk
3 – Assumes some risk
4 – Assumes minimal risk
5 – Assumes least risk

3. Cost Comparison

We have evaluated the cost of each alternative based on vendor surveys, discussions with state staff, and our experience in similar projects. We estimated both the capital improvement costs and the state internal costs for implementation in order to get comparable numbers for the alternatives. We also estimated operational costs (licensees and IT support) for five years to reflect the differences in cost of ownership for the alternatives.

Exhibit III-13 compares cost categories for the three alternatives. A rating of 1 indicates the alternative requires the most cost and a rating of 5 indicates it requires the least cost.

Exhibit III-13: Comparison of System-Based Costs

Category	Alternative 1 Custom Development	Alternative 2 Best of Breed	Alternative 3 ERP/SAP
Cost to meet WSDOT identified requirements	4,586,415	3,111,827	3,748,145
Maintenance and Operations Costs through FY2011	3,545,137	1,346,760	737,500
Total Costs	8,131,552	4,458,587	4,485,645
Tangible Benefits	**$5,534,000**	**$5,534,000**	**$5,534,000**

IV. Recommendation

■

A. Recommendation Overview

This study recommends Alternative 3 – Replacement of the existing system with an enterprise resource planning (ERP) system such as SAP to meet the consumable inventory management needs of WSDOT. An ERP system such as SAP should also meet the consumable inventory needs of the enterprise. Among the alternatives evaluated, this solution has by far the greatest benefits, the best investment value, and the most manageable risk. It provides an integrated solution sharing a single, centralized database, and promotes data integrity and efficiency through one point of entry and validation for data.

Importantly, it provides the best chance for obtaining financing among the three alternatives, because the consumable inventory management needs can be met by the Office of Financial Management's effort to replace core state financial and administration systems with a single instance of an ERP software solution.

The cost incurred by WSDOT to implement consumable inventory management on SAP by April 2007 would be approximately $4,486,000, with a break-even period of 3.5 years and a potential to realize an estimated $5,534,000 in tangible benefits over the first five years of operation.

The cost of delay is significant. This study recommends the project start July 2006 after DOP has completed its SAP HRMS implementation. WSDOT will lose approximately $3 million in potential benefits each year the project is delayed.

Since the WSDOT implementation will provide much of the functionality required by other agencies, it is reasonable to expect that system costs identified above ($4.5 million) be shared with those agencies. This is likely to significantly reduce the cost to WSDOT, and reduce the payback period for the investment.

When determining individual agencies' share of the cost, the state should consider the full cost of statewide implementation. Additional work is required to determine the costs, benefits, and risks of a statewide implementation, using this study as a starting point. Once that information is available, WSDOT should work with OFM, General Administration, and other key agencies to develop cost allocation and chargeback mechanisms for supporting initial system implementation and maintenance costs.

B. Rationale

Implementing an ERP as the consumable inventory management solution for WSDOT will provide for an efficient, effectively managed consumable inventory. This decision will provide WSDOT with accurate, timely, and detailed inventory information. A modern, flexible ERP solution will expedite and validate management decisions to reduce costs associated with inventory and inventory overhead, as well as provide for proactive planning of consumable needs to support WSDOT's service delivery goals. The capabilities of an ERP, such as SAP, will allow future technologies and "best practices" to be implemented without extensive reprogramming of the core system. Since the state has already made significant investments in SAP's ERP software, this study analyzed the cost, benefits, and risks of an SAP solution. The benefits identified are as follows:

1. Meets WSDOT and ECIT Requirements

The implementation of an ERP, such as SAP, is expected to support most of the consumable inventory management business requirements defined during the feasibility study by WSDOT and ECIT consumable inventory subject matter experts.

2. Supports WSDOT's Mission and Objectives

SAP supports WSDOT's objective of continuously improving the efficient and effective delivery of agency programs by providing an integrated supply chain that promotes industry "best practices" and visibility to the performance of the supply chain.

SAP also supports WSDOT's Management Principles by providing management with decision support information and supporting "best practices" and efficient processes.

3. Supports Enterprise Objectives

SAP meets the state's priorities and objectives by providing a means to consolidate core financial and administrative systems and by promoting standard, efficient processes that facilitate agency service delivery goals.

4. Supports Technology Strategies

A SAP solution supports agency and enterprise technology strategies by providing the following:

a. Integration of data and business processes.

A SAP solution offers a fully integrated supply chain. Assuming the state implements SAP as its purchasing and finance platform, the entire supply chain encompassing planning, procurement, inventory, vendor, material, warehouse,

and financial management would be integrated. The entire state could share commodity and vendor information. Agencies would no longer need to devote resources to the management and reconciliation of duplicate information.

b. Reduction of "point to point" systems that rely on interfaces or duplicate data entry to share information.

By implementing an integrated solution, WSDOT and other state agencies no longer have to maintain interfaces or do duplicate data entry to communicate data between inventory systems and other supply chain systems such as purchasing and finance systems. By eliminating these interfaces, users will no longer need to wait for the arrival or data entry of needed information.

c. Obsolescence of outdated technologies and data repositories.

Adoption of a single statewide consumable inventory system would eliminate the myriad of inventory management systems and data repositories within WSDOT as well as within other state agencies.

d. Access to information that supports both tactical operations and strategic analysis of the consumable inventory.

SAP's integrated environment provides management the ability to view information instantaneously to support decisions and day-to-day operations and to monitor performance.

e. A flexible solution that provides for future business needs and technologies.

SAP provides a configurable solution. It is flexible enough to allow agencies and warehouses to configure the system to suit their specific inventory management needs. In addition, SAP aggressively invests in research and development and facilitates communications with user groups so that future software upgrades offer relevant technological and industry "best practices."

5. Meets Technology Architecture Standards

From a technology perspective, a Web-enabled SAP package employing a relational database and supporting many industry-wide technology standards, is a valuable addition to the state's IT portfolio. It has strong vendor maintenance and support. SAP provides its users with a reliable help desk, frequent enhancements to package functionality, robust security, and new releases that keep the package current with changes in technology.

6. Provides for a Multi-agency Consumable Inventory Management Solution

The requirements identified by the ECIT for this study represent the majority of consumable inventory management needs for the agencies with the largest consumable inventory levels. By meeting these requirements, SAP offers WSDOT and other state agencies the opportunity to participate in an effort to implement a statewide consumable inventory management solution.

7. Promotes Data Integration and Process Efficiencies

The integration of inventory information can address many of the problems and inefficiencies associated with fragmented information that currently exist. This integrated data, along with built-in workflow, will improve management decisions and reduce elapsed time for many critical core processes that require multiple handoffs and approvals. This permits more resources to be deployed by adding value in the core of the state's business rather than nonvalue-added, transaction-processing activities.

A significant benefit of SAP's integrated architecture is that it is designed to provide improved response times for information collection and storage into a common database. This common database is a one-source storehouse of information that is accessible by other software components and people that need the inventory information.

Data need only be entered or updated once, reducing errors and generating information for inventory analysis, tracking, status, planning, and management. Ultimately, efforts and costs are shifted to innovation, problem solving, and direct service to customers rather than inputting, processing, organizing, verifying, and related "busy work."

The power of an integrated supply chain is that all functions from purchasing warehouse management, accounts payable, and contract management all have access to the same information. This offers the ability for procurement staff to understand inventory demands and vendor performance. Warehouse management could track a purchase request through delivery. Headquarters management could view the performance of the entire supply chain by accessing "real time" inventory status and activity information.

8. Promotes Data Integrity

Data integrity is greatly improved by having a single point of entry into the system and by reducing the number of times information is "touched" before it is recorded into a system. By having a single point of entry and by taking advantage of tools such as scanners, users would no longer need to translate information off multi-part forms or faxes, duplicate data entry would be eliminated, and interfaces between systems and data repositories would be greatly reduced.

9. Withstands Change

The ERP solution allows the state to maintain contemporary applications designed and built using the latest information technology. The applications can be kept current through frequent vendor-provided upgrades.

10. Supports Industry "Best Practices"

The ERP solution offers the state the opportunity to attain industry best practices by adopting the processes contained in the package.

A SAP system comes packaged with a wide range of best practices and with a structure that can facilitate changes that may not be possible in other circumstances, such as workflow and online approvals. This will create other opportunities for increased efficiency and service delivery.

11. Simplifies Technical Landscape

Each agency that uses consumables to support its service delivery goals has its own inventory system. Each of these systems communicates with other systems such as purchasing, finance, and maintenance management systems. Some use electronic interfaces while others require duplicate data entry. A single SAP would not only eliminate consumable inventory systems but also presents an opportunity to eliminate other supply chain support systems such as purchasing and accounting systems.

12. Supports Modern Inventory Management Tools and Techniques

SAP is a leading supply chain management product used by entities that have much more complex and demanding supply chains. SAP has integrated the use of modern inventory management techniques and tools to enable efficient management of the supply chain. For example, SAP can accept input from PDAs, scanners, and radio frequency identification devices. It has the ability to communicate directly with vendors. SAP also offers secure online approvals by management.

C. Implementation

WSDOT will lead the configuration of consumable inventory functionality within OFM's enterprise SAP implementation efforts. It is assumed OFM will deploy the use of a proven implementation methodology. This methodology will most likely be SAP's Accelerated SAP (ASAP) methodology or a similar methodology developed by an integration consultant. ASAP provides a very detailed, industry specific work plan, which may be customized to fit the specific needs of an enterprise or organization.

Since SAP is an enterprise effort, OFM will determine which SAP implementation cycle will include consumable inventory management functionality. WSDOT and ECIT should work with OFM to raise the priority of consumable inventory management, so that its requirements are met by the first implementation cycle.

OFM's implementation schedule has yet to be defined. In the meanwhile, WSDOT and the ECIT can realize value by focusing on the following:

- Consumable Inventory Management process improvements
- Working to prepare for SAP

1. Consumable Inventory Management Process Improvements

Through interviews and site visits, the project team developing this study recognized the need to improve and standardize WSDOT's inventory management processes. WSDOT relies on forms to communicate inventory activity. Inventory control points that relied on regional offices to process these forms had significant management issues due to the delay between the physical inventory activity such as recording the receipt of goods into the system.

- WSDOT Headquarters is currently working with its consumable inventory users from all regions to understand the limitations of the current system and to align business processes in order to gain data accuracies and efficiencies from the current system. By employing efficient inventory management processes, WSDOT is introducing staff to more standard inventory management processes and improved data.
- WSDOT Headquarters is also working to clean up consumable inventory control points and system information. By eliminating excess stock and by cleaning up vendor, commodity, and ICP information on the system, the inventory environment is simplified and easier to manage.
- WSDOT Headquarters is also training consumable inventory users from all regions on the Consumable Inventory Data Mart. This is a Web-based Hyperion database that contains historical inventory, vendor, and commodity information. By using the data mart, staff become familiar with Web-based and ad hoc reporting tools. By improving the accuracy and timing of information accessible through the Data Mart, managers have better information from which to base purchasing and supply decisions.

2. Working to Prepare for SAP

The current consumable inventory management environment within the state consists of a myriad of systems. Some are specifically consumable inventory systems, while others provide different functions yet have an inventory management component. In addition,

each inventory control point has its own processes. Many of these processes are tied to the type of commodities managed and the supporting system capabilities.

In preparation for the replacement of these systems and processes with SAP and its provided "best practices," WSDOT and the ECIT should complete the following:

- Secure ongoing, committed, and involved executive level support. This support should be from the very highest level possible.
- Explain the capabilities of SAP to other agencies that have consumable inventory and work with them to obtain their buy-in for the new system—and ultimately their concurrence to eliminate duplicate agency systems.
- Communicate the benefits of the new system to the decision-makers in terms of what the new system will bring to them.
- Communicate to OFM's ERP Roadmap team the added value to the state by implementing inventory management in the first cycle of the enterprise ERP finance and purchasing solution implementation.
- Plan and prepare for the appropriate level of resources, with the appropriate authority, to assist with the implementation.
- Work with other agencies to review inventory management processes and agree upon common inventory management objectives, performance measures, and business processes. Document issues, desired processes, and systems capabilities.
- Work with General Administration to determine how SAP will integrate vendor, commodity, and contract information. Understand the impact of this on inventory management processes.
- Work to resolve issues with current business processes and to align inventory management processes in preparation of migration to SAP.
- Develop a risk mitigation strategy to preserve current inventory management systems until they are replaced by SAP. This should include proper testing before system or software upgrades are implemented. Staff should also be trained on the support of current systems so that a backup resource is available if needed.
- Document the consumable inventory technical landscape for each participating agency. This includes systems, interfaces, and data stores.
- Finally, participate in the enterprise ERP project and change management efforts. Communicate progress on a regular basis with inventory managers and staff. Foster 2-way communication throughout all phases of the project.

D. Assumptions

In preparing this recommendation, the following assumptions have been made:

- An ERP implementation of consumable inventory management depends on the implementation of core ERP financials.
- The requirements developed for this study and approved by the ECIT sufficiently cover most of the consumable inventory requirements for the enterprise.
- OFM will invest in an ERP, most likely SAP, as the enterprise financial and administrative systems solution for the state.
- OFM will work with agencies to secure funding for the SAP implementation.
- Inventory management will be included in the first SAP implementation cycle.
- WSDOT will continue to lead the ECIT through the implementation of a consumable inventory management system solution.

V. Organizational Effects

■

A. Overview

While an enterprise implementation of SAP can have a profound impact on the technology of an organization, the package does not address the other significant components associated with a change of this magnitude—people and process. In fact, studies have shown that large IT projects more frequently fail due to leadership, organizational, and people issues than technology issues.

Affected individuals in all parts of the organization must understand what is changing and be ready, willing, and able to adapt to new ways of working. This requires careful planning and execution of activities to manage and deploy change well in advance of system "go-live."

To take advantage of the rich functions and features SAP can provide, the organizational change driven by the new system must be appropriately planned for and managed. In general, the types of changes that SAP systems drive are:

- Reduced data entry resulting from:
  - Full integration (i.e., data entered only once).
  - Data defaulting.
- Improved ease of use resulting from:
  - Fewer transactions and reports.
  - Menu drop down boxes.
  - Integrated on-line help.
- Improved access to information resulting from:
  - Real time updates.
  - Drill around and drill down for greater data detail.
  - Online reports.
  - Direct access by managers and employees.

A key organizational effect is the impact on staff from the elimination of many manual forms and redundant data entry due to the streamlining of data entry, transaction processing, and reporting. Reduced data entry and improved ease of use means that staff

can be more productive and efficient by focusing time on delivering state services rather than reentering redundant data, processing paper forms, and performing rework on administrative systems.

To be successful and realize identified benefits, organization change management must be addressed at every phase of the implementation and must encompass the technical changes, process changes, and organization changes as well as the accompanying impacts to the business and the organization. A structured organization change management approach helps the organization to:

- Embrace the need for change.
- Mitigate risks associated with large, complex implementations.
- Promote buy-in and sponsorship from key individuals.
- Provide an environment that institutionalizes change.
- Manage the transition throughout the entire implementation.

B. Organizational Change Management Approach

Organizations that have tried to achieve major business or technology transformations have found that the process of implementing change will most likely lead to a temporary drop in productivity. Change management helps to minimize the depth and length of disruption brought on as result of major change. People are rarely comfortable with change—even change that appears positive. Much, if not most, of this discomfort is due to the uncertainty of change. Employees and managers should assume equal responsibility for helping to minimize discomfort through knowledge and skill development, clarity of leadership, and open communications. Key principles of change management include the following:

- Change management does not begin at the end of a project (implementation phase); it should be considered from the beginning.
- Change in an organization is not simply putting in new machinery, systems, practices, or processes. People must exhibit behaviors aligned with the change or else it fails.
- Change is a *process* rather than an *event* and therefore it can be significantly influenced or managed during its "life cycle."
- Transformation encompasses the design and execution of a single change management focus. This is accomplished by simultaneously addressing strategic performance goals, drivers, and barriers to and enablers of change.

It is recommended that the State of Washington and WSDOT include comprehensive change management activities in the implementation portions of the SAP solution. Representative change management activities may address:

1. Alignment of Project Vision and Goals

The first step is to align the project vision and goals with the state's vision and goals. This activity includes:

- Reviewing the organization's vision statement and strategic plan.
- Assessing how well the vision is communicated and internalized throughout the organization.
- Analyzing the project's business case to determine if the drivers for the project align with the vision proposition.
- Creating a project vision.
- Developing project goals and critical success factors.
- Incorporating project vision and goals into the Communications Program.

2. Sponsorship Program

Establish a Sponsorship Program to enable and measure leadership commitment, readiness, and willingness to lead change. The activities of this program are:

- Selecting and interviewing key leaders.
- Documenting issues, concerns, and attitudes.
- Determining the sponsor roles and responsibilities.
- Educating leaders on the critical elements of effective sponsors.
- Assisting leaders in assessing their sponsorship capabilities.
- Recommending activities to close capability gaps.
- Assisting in developing transition activities for sponsors.
- Providing support necessary to enable sponsors to transition their employees.

3. Organization Readiness Assessment

Conduct an Organization Readiness Assessment to assess the state's and WSDOT's commitment, readiness, and ability to accept and sustain the changes required by this initiative, including cultural elements. The activities of the Organization Readiness Assessment are:

- Identifying issues that impede change.
- Identifying resistance points within the organization.
- Providing a picture of the organization's readiness to change.

- Developing interventions and activities to address change issues.
- Providing recommendations for transition management.

4. Communication Program

Develop and execute a Communication Program to manage project-related communications. The objectives of this program are:

- Creating guiding principles and a strategy for delivering targeted communication to multiple audiences.
- Identifying messages that provide a clear and timely exchange of information (verbal, written, visual, etc.).
- Determining audiences, message sequences, media types, and timing to address audience needs.
- Organizing communication campaigns that progressively build from awareness to acceptance and commitment.
- Planning, building, and maintaining the level of active participation needed to transition the organization through sponsors, change agents, and campaigns.
- Gathering feedback, adjusting communications, and sustaining enthusiasm.

5. Risk Mitigation Strategy

Identify, evaluate, and qualify the business impacts and risk factors associated with the changes to minimize risk. Create action plans to implement changes and mitigate risks. The activities of a risk mitigation strategy are:

- Identifying major business impacts based on information gathered during process design.
- Defining additional business impacts and obstacles during workshop sessions.
- Categorizing and prioritizing business impacts and risks.
- Assigning ownership to impacts and determining initial actions required for high priority changes/risks.
- Creating action plans to address process changes/risks.
- Tracking and monitoring the process change and risk mitigation action plans.

6. Change Agent Program

Establish a Change Agent Program to prepare and involve change agents to address stakeholder issues and concerns. This team implements the process changes and supports identified stakeholders. The activities of this program are:

- Determining the level of commitment/resistance of the key stakeholder groups.
- Defining an approach to address stakeholder issues and concerns.
- Defining transition activities to support and enable stakeholder groups.
- Identifying and organizing change agents to execute transition activities.
- Monitoring change agent activities and stakeholder responses to maintain active participation.
- Sustaining enthusiasm and momentum to enable change to become institutionalized.

7. Organization Transition Program

Perform an Organization Transition Program to identify, communicate, and implement the new/changed roles and responsibilities that result from redesigned business processes. The activities of this program are:

- Defining new/changed roles resulting from process design activities.
- Identifying gaps and redundancies in current and new/changed roles based on new/changed processes.
- Determining new skills needed to support the new/changed processes.
- Communicating findings to the project and management teams at multiple levels.
- Involving management in determining changes needed to align the target organization and create new jobs.
- Creating organization transition plans to prepare the employees to accept their new jobs.

8. Performance Based Training

Develop and deliver performance based training to enable employees to develop the business, application, and technical skills needed to execute the solution. The objectives of this training are:

- Assessing user and application requirements to define a learning strategy that meets the needs of the users.

- Defining and developing the curriculum and system infrastructure needed to deliver effective training.
- Creating training materials and e-learning, including possible Web-based and virtual classroom to meet requirements.
- Conducting training, just enough, just in time.
- Creating Performance Support, On-line Help, and Ongoing Training Programs.

9. Transition Management Plan

Support the actual deployment of the process changes, change strategies, and transition activities developed as part of the Organization Change Management Program through a Transition Management Plan. The activities of this plan are:

- Coordinating and performing transition management that supports the following organizational change management components:
  - Project and Organization Vision Alignment.
  - Organization Readiness Assessment.
  - Sponsorship Program.
  - Change Agent Deployment Program.
  - Communications Program.
  - Process Change Implementation and Risk Mitigation Program.
  - Organization Transition.
- Monitoring and coordinating dependencies, feedback results, and transition activities, and making adjustments as necessary.

C. Recommendations

It is recommended that WSDOT focus on implementation tasks, as listed in the Recommendation section of this report, in order to prepare for the upcoming change that a statewide SAP implementation will bring. These recommended implementation tasks include change management activities to secure sponsorship, understand the impact of the change on current business processes, systems, and organization roles; mitigate risk; and secure buy-in from stakeholders on the value and need for the change.

VI. Project Management and Organization

■

A. Overview

An SAP consumable inventory management solution depends upon the implementation of core SAP financial functions. These functions must be implemented before or at the same time as the inventory management functions. The Office of Financial Management is currently leading the development of an "SAP Roadmap." This roadmap will determine how the state will employ an ERP, such as SAP, as its core financial and administrative systems platform. At the time of this study, OFM has not yet determined the SAP project schedule, funding method, or implementation cycles and scopes.

OFM hopes to begin the first of multiple implementation cycles in January 2006. Each cycle will implement specific financial and administration functions. These implementation cycles might be considered projects within a greater enterprise SAP implementation program.

B. Project Governance

If consumable inventory management is within the scope of the first implementation cycle, then the scope of the project will also include core financials functions. Therefore, the implementation of consumable inventory management into SAP will not exist as an independent project and will not have its own project governance structure. As part of the ERP Roadmap effort, OFM will define the scope of each implementation cycle project and project governance structures.

Most likely, there will be a consumable inventory management team within one of OFM's ERP implementation cycle projects. This team will be responsible for defining the inventory management processes and information needs. The team will also configure the software to meet the needs of the enterprise with consideration towards unique agency processes. Finally, the team may also participate in software tests, user training, and documentation development.

It is assumed that this team will be led by and consist of WSDOT and ECIT consumable inventory subject matter experts.

VII. Estimated Timeframe and Work Plan

■

A. Overview

OFM does not plan to start an enterprise implementation of SAP financials until after the state has successfully deployed SAP as its human resource management and payroll system. In addition, OFM must secure funding for the statewide financial and administrative implementation of SAP. OFM plans to request funding in January 2006. Therefore, efforts to implement consumable inventory management to SAP cannot begin until at least July 2006.

B. Estimated Timeframe

If consumable inventory management requirements are determined within the scope for the first implementation cycle, then it will begin approximately July 2006. Assuming this, the phased schedule for the implementation of the consumable inventory management cycle is estimated in Exhibit VII-1**:** SAP Project Schedule of Phases**.** This schedule may change depending on the implementation cycle, the scope of the cycle, and the cycle start dates, which will be defined by OFM.

This schedule would change if OFM decides to implement inventory management at a later date. This schedule includes a 20 percent schedule contingency.

Exhibit VII-1: ERP Project Schedule of Phases

Phase	Begin Date	End Date
Preparation	07/01/06	07/31/06
Blueprint	07/31/06	09/30/06
Realization	10/01/06	01/31/07
Final Preparation	02/01/07	03/15/07
Support	03/16/07	04/30/07
“go-live”	n/a	04/30/07

The work plan, milestones, and scope of the implementation cycles will be defined by OFM. As an enterprise implementation, it is assumed OFM will deploy the use of a proven implementation methodology. This methodology will most likely be SAP’s Accelerated SAP (ASAP) methodology or a similar methodology developed by an integration

consultant. ASAP provides a very detailed, industry specific work plan, which may be customized to fit the specific needs of an enterprise or organization.

C. Estimated Resources

Project hours for this alternative are based on estimates for individual roles provided by SAP. Understanding that consumable inventory management functionality will be included within a larger implementation cycle, this estimate reflects WSDOT's contribution to an enterprise implementation of consumable inventory management. In addition, roles, which SAP expects the state to provide, were included in its estimate. These project roles, and roles expected to be supplied by the project integration, including approximate hours allocated to each, are described in Exhibit VII-2.

Each of these roles is described in Appendix D: Staff Role Descriptions.

Exhibit VII-2: SAP Project Roles

Role	Number	Hours
Vendor Staff		
Project Manager	1	1120
Workflow Consultant	1	800
Inventory Consultant	1	880
Materials Management Consultant	1	1120
Warehouse Consultant	1	1040
Independent Quality Assurance Staff		
Quality Assurance Consultant	1	1000
State Staff		
Program Manager	1	280
Project Manager	1	1120
Business Analyst	1	1120
Infrastructure (Network and System) Support Person	1	560
Legacy System Analyst	1	560
Data Modeler	1	280
Data Conversion Developer	1	1120
Data Entry (for data conversion)	1	560
Subject Matter Expert	10	1120
Training Specialist	1	480
Administrative/Documentation Support	1	1120

Role	Number	Hours
Acceptance Tester	7	560
Integrator Staff		
Project Manager	1	560
Business Analyst	1	1120
Data Modeler	1	560
SAP Functional Specialist	1	1120

VIII. Cost/Benefit Analysis

■

A. Overview

The ISB's Feasibility Study Guidelines for Information Technology Investments contain a set of Cost Benefit Analysis Forms for use in comparing the costs and tangible benefits among IT project alternatives. The forms are located at the end of this section. Each form is followed by a list of assumptions that was used as the basis for developing the costs included in the form.

B. Cost/Benefit Analysis Forms

The costs for implementing a Consumable Inventory system outside of the Department of Transportation are not included in these estimates.

1. Alternative 1 – Custom Development

The following cost and benefit forms are included for the Custom Development Alternative:

- Exhibit VIII-1: Custom Development Alternative 1 – Cost Benefit and Cash Flow Analysis (Form 1).
- Exhibit E-1: Custom Development Alternative 1 – Fiscal Costs, Project Development (Form 2).
- Exhibit E-3: Custom Development Alternative 1 – Summary, Operations Incremental Cost of Project (Form 3).
- Exhibit E-4: Custom Development Alternative 1 – Current versus Proposed Method Operations (Form 4)
- Exhibit E-6: Custom Development Alternative 1 – Benefits Cash Flow Analysis (Form 5)

2. Alternative 2 – Best of Breed Package

The following cost and benefit forms are included for the Best of Breed Alternative:

- Exhibit VIII-2: Best of Breed Package Alternative 2 – Cost Benefit and Cash Flow Analysis (Form 1)

- Exhibit E-8: Best of Breed Package Alternative 2 – Fiscal Costs, Project Development (Form 2)
- Exhibit E-9: Best of Breed Package Alternative 2 – Summary, Operations Incremental Cost of Project (Form 3)
- Exhibit E-10: Best of Breed Package Alternative 2 – Current versus Proposed Method Operations (Form 4)
- Exhibit E-12: Best of Breed Package Alternative 2 – Benefits Cash Flow Analysis (Form 5)

3. Alternative 3 – ERP Package (SAP)

- Exhibit VIII-3: ERP Package (SAP) Alternative 3 – Cost Benefit and Cash Flow Analysis (Form 1)
- Exhibit E-16: ERP Package (SAP) Alternative 3 – Summary, Operations Incremental Cost of Project (Form 3)
- Exhibit E-17: ERP Package (SAP) Alternative 3 – Current versus Proposed Method Operations (Form 4)
- Exhibit E-19: ERP Package (SAP) Alternative 3 – Benefits Cash Flow Analysis (Form 5)

Alternative 1 – Custom Development

Exhibit VIII-1: Custom Development Alternative 1 – Cost Benefit and Cash Flow Analysis (Form 1)

	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY2012	FY2013	GRAND TOTAL
Total Outflows	0	4,586,415	829,401	783,916	638,783	638,886	654,150	0	0	8,131,552
Total Inflows	0	0	2,975,500	526,250	572,000	702,500	757,500	0	0	5,533,750
Net Cast Flow	0	(4,586,415)	2,146,099	(257,666)	(66,783)	63,614	103,350	0	0	
Incremental NPV	NA	(4,199,918)	(2,319,298)	(2,535,368)	(2,588,958)	(2,540,109)	(2,464,164)	(2,464,164)	(2,464,164)	
Cumulative Costs	NA	4,586,415	5,415,816	6,199,733	6,838,516	7,477,402	8,131,552	8,131,552	8,131,552	
Cumulative Benefits	NA	0	2,975,500	3,501,750	4,073,750	4,776,250	5,533,750	5,533,750	5,533,750	

Cost of Capital	Breakeven Period – Years		NPV $	IRR %
	Non-Discounted	Discounted		
4.50%	N/A	N/A	(2,464,164)	N/A

Assumptions for Exhibit VIII-1: Custom Development Alternative 1 – Cost Benefit and Cash Flow Analysis (Form 1):

Costs – Project costs are "planning level" estimates.

Costs to be Funded – The project costs to be funded consist of the project development costs for the development period (FY2006) displayed in Form 2, Total project costs to be funded are $4.6 million.

Cost of Capital – The estimated cost of capital (4.5 percent) was provided by the State Treasurer's office.

Breakeven Period -- A payback period formula is used for this calculation. This formula is: payback period = last year with a negative cumulative cash flow + (absolute value of cumulative cash flow in that year divided by total (incremental) cash flow in the following year). The year in which the investment is completed is considered to be year zero.

Note: The project schedule for the Custom Development Alternative spans biennia by a few months. The project should be funded in such a way as to provide sufficient funding for the life of the project.

Alternative 2 – Best of Breed Package

Exhibit VIII-2: Best of Breed Package Alternative 2 – Cost Benefit and Cash Flow Analysis (Form 1)

	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY2012	FY2013	GRAND TOTAL
Total Outflows	0	3,111,827	247,250	257,250	268,250	280,350	293,660	0	0	4,458,587
Total Inflows	0	0	2,975,500	526,250	572,000	702,500	757,500	0	0	5,533,750
Net Cash Flow	0	(3,111,827)	2,728,250	269,000	303,750	422,150	463,840	0	0	
Incremental NPV	NA	(2,849,593)	(458,837)	(233,264)	10,480	334,648	675,490	675,490	675,490	
Cumulative Costs	NA	3,111,827	3,359,077	3,616,327	3,884,577	4,164,927	4,458,587	4,458,587	4,458,587	
Cumulative Benefits	NA	0	2,975,500	3,501,750	4,073,750	4,776,250	5,533,750	5,533,750	5,533,750	

Cost of Capital	Breakeven Period – Years		NPV $	IRR %
	Non-Discounted	Discounted		
4.50%	2.38	2.80	675,490	17.97%

Assumptions for Exhibit VIII-2: Best of Breed Package Alternative 2 – Cost Benefit and Cash Flow Analysis (Form 1):

Costs – Project costs are "planning level" estimates.

Costs to be Funded – The project costs to be funded consist of the project development costs for the development period (FY2006) displayed in Form 2, Total project costs to be funded are $3.1million.

Cost of capital – The estimated cost of capital (4.5 percent) was provided by the State Treasurer's office.

Breakeven Period -- A payback period formula is used for this calculation. This formula is: payback period = last year with a negative cumulative cash flow + (absolute value of cumulative cash flow in that year divided by total (incremental) cash flow in the following year). The year in which the investment is completed is considered to be year zero.

Alternative 3 – ERP Package (SAP)

Exhibit VIII-3: ERP Package (SAP) Alternative 3 – Cost Benefit and Cash Flow Analysis (Form 1)

	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	GRAND TOTAL
Total Outflows	0	3,748,145	147,500	147,500	147,500	147,500	147,500	0	4,485,645
Total Inflows	0	0	2,995,471	545,223	572,000	702,500	757,500	0	5,572,694
Net Cash Flow	0	(3,748,145)	2,847,971	397,723	424,500	555,000	610,000	0	
Incremental NPV	NA	(3,432,289)	(936,621)	(603,107)	(262,466)	163,716	611,961	611,961	
Cumulative Costs	NA	3,748,145	3,895,645	4,043,145	4,190,645	4,338,145	4,485,645	4,485,645	
Cumulative Benefits	NA	0	2,995,471	3,540,694	4,112,694	4,815,194	5,572,694	5,572,694	

Cost of Capital	Breakeven Period – Years		NPV $	IRR %
	Non-Discounted	Discounted		
4.50%	3.14	3.49	611,961	13.80%

Assumptions for Exhibit VIII-3: ERP Package (SAP) Alternative 3 – Cost Benefit and Cash Flow Analysis (Form 1):

Costs – Project costs are "planning level" estimates.

Costs to be Funded – The project costs to be funded consist of the project development costs for the development period (FY2006). Total project costs to be funded are $3.7 million.

Cost of capital – The estimated cost of capital (4.5 percent) was provided by the State Treasurer's office.

Breakeven Period -- A payback period formula is used for this calculation. This formula is: payback period = last year with a negative cumulative cash flow + (absolute value of cumulative cash flow in that year divided by total (incremental) cash flow in the following year). The year in which the investment is completed is considered to be year zero.

IX. Risk Management

■

A. Overview

This section identifies WSDOT's risk management plan for implementing consumable inventory management within SAP. It is critical to the successful implementation of the proposed solution that potential risks be identified and communicated, and a risk management strategy be developed and implemented along with appropriate quality assurance and project oversight.

1. WSDOT Consumable Inventory Risk Management Strategies

The following specific risks and risk management strategies have been identified:

a. ERP Roadmap

The Department of Personnel (DOP) is currently implementing SAP as an enterprise human resource and payroll (HRMS) system. The Office of Financial Management (OFM) is currently developing a strategy for implementing an ERP, such as SAP, as the state's core financial and administrative system. Consumable inventory management would be within the scope of OFM's efforts. OFM has decided to defer implementing an ERP enterprise finance and administrative system solution until DOP has implemented SAP HRMS. If DOP's project does not meet its milestones or if OFM's Roadmap strategy is stalled or fails to get funding, then WSDOT will not realize a timely consumable inventory management solution.

Risk Management Strategy:

WSDOT and the ECIT must monitor the progress of DOP's SAP HRMS implementation and the activities of OFM's ERP Roadmap efforts. If milestones are not met, or the SAP finance and administration implementation is stalled or cancelled, then WSDOT and ECIT should consider a best of breed solution.

b. Current System Failure

SAP will replace WSDOT's legacy consumable inventory system. This system is old, fragile, and at risk of failure.

Risk Management Strategy:

WSDOT must develop a risk mitigation strategy to preserve the current system until it is replaced by SAP. This should include proper testing before system or software upgrades are implemented.

c. Loss of Key Support Staff

A limited number of personnel supports the legacy consumable inventory system. These support personnel have experience supporting some outdated technologies and computer languages. If support staff retires or moves on to other positions, the legacy consumable inventory system will lack sufficient support.

Risk Management Strategy:

WSDOT must develop a risk mitigation strategy which documents system support tasks such as disaster and error recovery, system schedules, interfaces, etc. WSDOT also needs to train support personnel so that a backup resource is available if needed.

d. Lack of Project Support, Focus, Discipline, and Resources

SAP will replace the consumable inventory system, which is critical to WSDOT's mission. Without sponsorship of this project, it will be very difficult to maintain focus on its critical goals. Without a disciplined approach to project coordination, interagency collaboration, and department-level organizational planning, uncoordinated, unplanned, and conflicting activity can be expected. Finally, high-level commitment to ensure adequate human and financial resources for the project is essential to its successful implementation.

Risk Management Strategy:

This project must have the strong support of WSDOT, OFM, and DIS Directors. The project governance structure must include broad representation by project stakeholders along with strong executive-level sponsorship and project leadership.

e. Policy Issues Not Resolved

An especially important area of decision-making for the project is the policy area. Policy issues might arise at the project planning or implementation level. Failure to resolve these issues in a timely fashion will result in the inability to complete the implementation of affected system functions and rework, and cause cost overruns and schedule slippage.

Risk Management Strategy:

Decisions on policy issues must be tied to the project's governance structure. This process includes assignment of policy issues to a responsible party or committee, the coordination of issues by project management, and the escalation of issues using the project's steering committees.

f. Lack of Stakeholder Buy-In

Stakeholders for this project include all parties within WSDOT and the state who rely on consumable inventory information or support the consumable inventory, its processes, systems, and databases. If any of these groups is not substantively involved and committed to the project, this could seriously jeopardize a successful outcome.

Risk Management Strategy:

The recommended project governance structure includes significant stakeholder participation. It also includes a high level of participation and oversight by the DIS and WSDOT's OIM. The proposed implementation plan includes communication of the overall mission and vision of the project to executives, managers, and staff throughout WSDOT.

g. Lack of Understanding of Project Success Factors

Failure by project management to understand and incorporate success factors for IT projects results in a poorly managed project and an inability to achieve project goals within the time and budget allocated.

Risk Management Strategy:

The project management structure defined for this project must include a project manager for the system integrator who is highly experienced with SAP projects and who will incorporate critical success factors into the project's plan and operations. In addition, project management will convey best practices to the project team and provide coaching and training.

h. Lack of Understanding of the Impact of Change

Change management is the process of aligning an organization's people and culture with system, business, and organizational changes. Change management necessitates identifying areas of the organization that will be affected by the project and specifically addresses the process transition for those areas. Effective change management is critical to the success of implementating SAP.

Risk Management Strategy:

The goals of change management are to build an understanding of and commitment to change, align key organizational elements to support the change, and enable continuous performance improvement to sustain the changes. A review with WSDOT stakeholders should be conducted to assess their capacity for and receptivity to implementing significant business process changes that will be essential to the success of implementing a new system. Project goals and objectives should be clarified and a plan to address those business areas of the organizations that will need the most attention to ensure a successful transition.

i. Unrealistic Expectations

Project stakeholders may expect results from the project that are unrealistic, or are to be delivered as part of a later phase. Examples include:

Agency managers may expect users to be proficient with the new system as soon as training has been completed, rather than understanding that there may be a temporary decrease in productivity while users adjust to the many new features and functions in the system.

Agency plans may have underestimated the impact of the process and organizational changes associated with the new system.

Risk Management Strategy:

The project requires a change management approach and implementation plan which involves careful and regular communications to project stakeholders concerning the expected results of the project for each phase and each major functional component.

j. Fear and Opposition

When faced with the process, organizational, and possibly job duty changes associated with this project, it is normal for staff to resist the changes in various ways. If this resistance is not brought to the surface and effectively addressed, it can result in staff refusing to accept the change—in this case, the new system. If this occurrs, even the best system implementation, from a technical standpoint, would be labeled a failure by the rank and file staff required to use it.

Risk Management Strategy:

The change management approach and implementation plan should include strategies for identifying and addressing areas of resistance to change on the part of system users. This starts with the commitment of the executives, department managers, and project stakeholders working through the issues necessary for the

project's success. One of these strategies is a significant commitment on the part of WSDOT staff to design and configure the appropriate processes and rules for the new system. Staff must also participate in training and testing activities. In addition to building ownership in the design of the system, this will build a network of skilled users among the agencies.

k. Lack of Successful Experience in All Aspects of SAP Implementation

If the project team lacks successful experience with a SAP implementation, including consumable inventory functions, change management, and the technologies involved, there is a significant risk of project failure. This experience is required in order to assure that project management and team members will anticipate and avoid technical and organizational problems, will develop and follow a realistic project plan and schedule, and will adopt the appropriate technical and organizational strategies for the project.

Risk Management Strategy:

The project management structure must include a private firm with extensive experience implementing SAP packages serving as system integrator. This firm should have specific experience with the package and technologies proposed in a public sector environment. The system integrator will provide project management and system implementation standards and best practices, based on broad experience implementing SAP systems in similar environments. Throughout the project, knowledge transfers will take place between the integrator and WSDOT staff.

l. Scope Management

Implementing SAP brings with it a very significant functional and organizational scope. If not effectively structured and managed, this scope could easily become too large to accomplish within the limited budget and time allocated. There is also a significant risk of cost overruns as a result of unmanaged scope.

Risk Management Strategy:

By placing the project within a solid project governance structure, the risk of unwieldy and unmanaged scope will be significantly reduced.

The scope of changes to business processes will be carefully defined during the design phase of the project. A detailed description of functionality will be communicated to the stakeholders to avoid any misunderstanding of the project scope. The project plan will include a decision structure for any changes to the scope, including the estimated time, effort, resource, and cost implications of the change.

m. No Allowance for Unexpected Events

It is in the nature of projects—especially IT projects—that unexpected events occur which affect the project's scope, objectives, and resources available. Schedule and budget contingencies are necessary to give WSDOT the ability to respond to their unexpected effects. Since requirements may change or require more detailed definition, there is a risk of changes to scope and required resources. Without allowing for these changes, there would likely be insufficient dollars and time to complete the project.

Risk Management Strategy:

Changes to the project schedule, budget, scope, and resources must be reviewed and approved by the project steering committee. It is recommended that the agreed upon project budget and schedule include 20 percent contingency for addressing unexpected changes.

n. Lack of Adequate Funding and Project Continuity

Frequently, significant IT projects are not adequately funded. This leads to inability to deliver needed functionality, the stopping of the project in mid-course until adequate funding can be approved, and the additional cost and risk associated with stopping and restarting the project. It is critical that this project be adequately funded.

Risk Management Strategy:

To ensure adequate funding and project continuity, this project should be funded at an appropriate level within WSDOT and the state.

o. Extensive Modifications to Complex System

Implementing extensive modifications to SAP's consumable inventory functions would severely limit WSDOT's options for future changes and upgrades to the system. In either case, system enhancements would require extensive testing to ensure they work correctly, which would reduce the risk of unanticipated problems and bugs.

Risk Management Strategy:

There should be a commitment by WSDOT and ECIT to implement consumable inventory functions within SAP with few, if any, modifications. Business process may need to change to accommodate the system.

p. Undetected Risk Issues

The internal management and team members for an IT project must attend to the myriad day-to-day details of tasks, process changes, design specifications, and technical solutions. The project is also typically organized in teams, each team having a specific focus. This can make it difficult to detect inter-team or project-wide issues, which create significant risk for the project. It also happens that these issues are often detected too late to minimize their impact on the project.

Risk Management Strategy:

An External Quality Assurance consultant should be provided for this project so that issues are detected as early as possible to reduce or eliminate their impact on project schedule and resources.

q. Only One Perspective of Project Solutions

Project management and team members are frequently too close to project details to consider the broadest range of solutions for issues of project schedule, scope, and resource management. This can lead to missed opportunities, wasted time and energy, and failure to apply the team's energy efficiently.

Risk Management Strategy:

The External Quality Assurance consultant recommended for this project will bring a broad perspective and significant experience addressing management, schedule, and resource issues for IT projects. This will add a needed external, third-party perspective to project issues, yielding a wider range of choices for management and better solutions for the project as a whole.

B. Project Oversight

The level of oversight for IT projects required by the Information Services Board (ISB) is determined by completing the ISB's Project Severity Level and Project Risk Level matrices, then comparing the results to the oversight standards established by the ISB.

The matrices consist of ISB prescribed severity and risk level attributes. The response to these attributes are used to establish the level and degree of oversight required on a particular IT project. Severity level gauges the proposed project's impact on citizens and state operations, its visibility, and the consequences of doing nothing. Risk level gauges the impact of the project on the organization, the level of effort needed to complete the project, the stability of the proposed technology, and agency preparedness.

The first step in completing the matrices is responding to all attributes by checking those statements that apply to the proposed project. Then, the responses are reviewed. The highest level evaluation in a category determines the severity or risk level for that category. For

example, within a given category there may be several attributes checked. If an attribute associated with a “High” severity or risk level was checked, the severity or risk level for the category is “High” even though one or more attributes with “Medium” or “Low” severity or risk levels are contained in the same category.

1. Project Severity Level

The Project Severity Level matrix is used to gauge the impact of the project in the following categories:

- Impact on clients.
- Visibility.
- Impact on state operations.
- Failure or nil consequence.

The matrix contains attributes for each category aligned with a severity rating of “High,” “Medium,” and “Low.” The appropriate attributes for the project were determined and indicated by a check in the corresponding box. When attribute determination was complete, the responses in each of the four severity categories were used to determine overall severity level. Exhibit IX-1 presents completed Project Severity Level matrix for the proposed solution.

Exhibit IX-1: Project Severity Level

	Categories			
Severity Level	**Impact on Citizens**	**Visibility**	**Impact on State Operations**	**Failure or Nil Consequences**
High	☒ Direct contact with citizens, political subdivisions, and service providers – including benefits payments, and transactions	☐ Highly visible to public, trading partners, political subdivisions and Legislature ☐ Likely, subject to hearings ☐ System processes sensitive / confidential data	☐ Statewide or multiple agency involvement / impact ☐ Initial mainframe or network acquisition	☐ Inability to meet legislative mandate or agency mission ☐ Loss of significant federal funding
Medium	☐ Indirect impacts on citizens through management systems that support decisions that are viewed as important by the public ☐ Access by citizens for information and research purposes	☒ Some visibility to the Legislature, trading partners, or citizens the system / program supports ☐ May be subject to hearings	☒ Multiple divisions or programs within agency	☒ Potential failure of aging systems
Low	☐ Agency operations only	☐ Internal agency only ☐ Not likely to be subject to hearings.	☐ Single division ☐ Improve or expand existing networks or mainframes with similar technology	☒ Loss of opportunity for improved service delivery or efficiency ☒ Failure to resolve customer service complaints or requests.

Based on responses in each category, the Severity Level for this project is judged to be **Medium**.

2. Project Risk Level

The Project Risk Level matrix is used to gauge the impact of the project in the following categories:

- Functional impact on business processes or rules.
- Development effort and resources.
- Technology.
- Capability and Management.

The matrix contains attributes for each category aligned with a risk rating of "High," "Medium," and "Low." The appropriate attributes for the project were determined and indicated by a check in the corresponding box. When attribute determination was complete, the responses in each of the four severity categories were used to determine overall risk level. Exhibit IX-2 presents completed Project Risk Level matrix for the proposed solution.

Exhibit IX-2: Project Risk Level

	Categories			
Risk Level	**Functional Impact on Business Processes or Rules**	**Development Effort and Resources**	**Technology**	**Capability and Management**
High	☐ Significant change to business rules ☐ Replacement of a mission critical system ☐ Multiple organizations involved ☐ Requires extensive and substantial job training for work groups	☐ Over $5 million ☐ Development and implementation exceeds 24 months after feasibility study or project approval and release of funds ☐ Requires a second decision package	☐ Emerging ☐ Unproven ☐ Two or more of the following are new for agency technology staff or integrator, or are new to the agency architecture: programming language; operating systems; database products; development tools; data communications technology. ☐ Requires PKI certificate. ☐ Complex architecture – greater than 2 tier	☐ Minimal executive sponsorship ☐ Agency uses ad-hoc processes ☐ Agency and/or vendor track record suggests inability to mitigate risk on project requiring a given level of development effort.

	Categories			
Risk Level	**Functional Impact on Business Processes or Rules**	**Development Effort and Resources**	**Technology**	**Capability and Management**
Medium	☒ Moderate change to business rules ☐ Major enhancement or moderate change of mission critical system ☐ Medium complexity business process(es) ☒ Requires moderate job training	☒ Under $5 million but over agency delegated authority ☐ 12 to 24 months for development and implementation after feasibility study or project approval and release of funds	☐ New in agency with 3rd party expertise and knowledge transfer. ☐ One of technology listed above are new for agency development staff.	☐ Executive sponsor knowledgeable but not actively engaged ☐ System integrator under contract with agency technical participation ☐ Agency and/or vendor record indicates good level of success but without the structure for repeatability.
Low	☐ Insignificant or no change to business rules ☐ Low complexity business processes ☐ Significantly simplifies and/or replaces manual activities ☐ Some job training could be required.	☐ Within agency delegated authority ☒ Under 12 months for development and implementation after feasibility study or project approval and release of funds	☒ Standard, proven agency technology.	☒ Strong executive sponsorship ☐ Agency and vendor have strong ability to mitigate risk on a development project ☒ Project uses documented and repeatable processes for tracking status, problems, and change. ☐ Agency or vendor is CMM Level 3 equivalent or above

Based on responses in each category, the Risk Level for this project is judged to be **Medium.**

3. Required Project Oversight

The level of oversight required for the proposed solution is determined by entering the results of the Project Severity Level and Project Risk Level calculations into the Project Oversight Level matrix provided by the ISB. Exhibit IX-3 identifies the level of oversight necessary for this project.

Exhibit IX-3: Project Oversight Level

	☐ **Low Risk**	☒ **Medium Risk**	☐ **High Risk**
☒ **High Severity**	☐ Level 2 Oversight	☐ Level 2 Oversight	☐ Level 3 Oversight
☐ **Medium Severity**	☐ Level 1 Oversight	☒ Level 2 Oversight	☐ Level 2 Oversight
☐ **Low Severity**	☐ Level 1 Oversight	☐ Level 1 Oversight	☐ Level 1 Oversight
This project will require **Level 2 Oversight**.			

4. Level 2 Oversight

Level 2 Oversight requires certain actions, governance and oversight structures for implementation of the proposed solution. The requirements are described in Exhibit IX-4.

Exhibit IX-4: Level 2 Project Oversight Requirements

Category	Requirement
Approval Level	DIS Director (may recommend full ISB oversight)
Investment Plan	Required
Quality Assurance	Internal or External (Agency Discretion)
In Portfolio	Required
Oversight	Level of Management Of Strategic Technologies Division (MOSTD) staff involvement dependent on project and consultation with agency
Project Reporting and Status	Agency provides copies of key written reports to MOSTD staff
Key Meeting Participation by DIS MOSTD Staff	MOSTD staff invited to steering committee and project status meetings

The project management and organization plan recommended to support the implementation of the proposed solution is in full compliance with Level 2 Oversight.

Appendix A: Project Governance

■

A. Consumable Inventory Feasibility Study Project Team

Member	Department/Title
Richard Ybarra	WSDOT – Project Sponsor WSDOT Assistant Secretary for Finance and Administration
Dave Davis	WSDOT – Project Manager WSDOT HQ Purchasing and Material Manager
Linda Smith	WSDOT – HQ Inventory Manager
Kim Williams	WSDOT – HQ Management Analyst
Bruce Cebell	WSDOT – HQ Management Analyst
Marilyn Bowman	WSDOT – HQ Administrative Services
Peggy Nelson	DSHS – FSA PMX-2 Project Manager
Rick Hess	WSDOT – Eastern Region
Bill Dye	Dye Management Group, Inc.
Dave Fish	Dye Management Group, Inc.
Tom Crawford	Dye Management Group, Inc.
Nellie Petuskey	Dye Management Group, Inc.
Venkat Pat	Dye Management Group, Inc.

B. Enterprise-wide Consumable Inventory Team

Team Member	Department
Dave Davis	WSDOT – Project Manager WSDOT HQ Purchasing and Material Manager
Kim Williams	WSDOT – HQ Management Analyst
Christopher Carlile	OFM
Bruce Cebell	WSDOT – Information Technology
Margaret Curtin	WSDOT – HQ Management Analyst
Steve Demel	GA
Susan Dodson	OFM

Team Member	Department
Rick Hess	WSDOT – Eastern Region
Mike Mask	WSDOT
Mona Moberg	WSDOT
Peggy Nelson	DSHS – FSA PMX-2 Project Manager
Linda Olson	WSDOT – NW Region Purchasing Manager
Linda Smith	WSDOT – HQ Inventory Manager
Jodie Stanton	WSDOT
Roger Slack	DSHS
David Koch	DIS

Appendix B: Interviews and Focus Groups

■

A. Executives Interviewed

Executive	Department / Title
Richard Ybarra	WSDOT – HQ Finance and Administration, Assistant Secretary for Finance and Administration
Chris Christopher	WSDOT - HQ M&O Maintenance, State Maintenance Engineer
Paula Hammond	WSDOT – HQ Secretary's Office, Chief of Staff
John Conrad	WSDOT – HQ Engineering and Regional Operations, Assistant Secretary, Engineering and Regional Operations Division
Dennis Jones	Office of Financial Management
Judy Devine	Department of Social and Health Services - Deputy CFO
Sam Kuntz	WSDOT Washington State Ferries, CFO

B. Stores Focus Group

Monday, April 5, 2005

Name	Representing
Dave Davis	WSDOT – HQ Purchasing and Materials Manager
Linda Smith	WSDOT – HQ Inventory Manager
Margaret Curtin	WSDOT – HQ Management Analyst
Kim Williams	WSDOT – HQ Management Analyst
Lance Yount	GA/OSP – Supply Officer 2
Linda Olson	WSDOT – NW Region Purchasing Manager
Peggy Nelson	DSHS – FSA PMX-2 Project Manager
Don Higgins	DSHS – Yakima Valley School Supply Officer
Venkat Pat	Dye Management Group, Inc.
Nellie Petuskey	Dye Management Group, Inc.

*Other subject matter experts attended via telephone or video conference.

C. Maintenance Focus Group

Tuesday, April 6, 2004

Name	Representing
Dave Davis	WSDOT – HQ Purchasing and Materials Management
Linda Smith	WSDOT – HQ Inventory Management
Kim Williams	WSDOT – HQ Management Analyst
Ron Bashon	WSDOT – Olympic Region Operations
Tom Clay	WSDOT – Maintenance Staff Assistant
Bob Lee	WSDOT – Maintenance Finance Manager
Venkat Pat	Dye Management Group, Inc.
Nellie Petuskey	Dye Management Group, Inc.

*Other subject matter experts attended via telephone or video conference.

D. Accounting Focus Group

Wednesday, April 7, 2004

Name	Representing
Dave Davis	WSDOT – HQ Purchasing and Materials Management
Linda Smith	WSDOT – HQ Inventory Management
Kim Williams	WSDOT – HQ Management Analyst
Margaret Curtin	WSDOT – HQ Management Analyst
Peggy Nelson	DSHS – FSA PMX-2 Project Manager
Linda Raber	SCR – Financial Services Manager
Debbie Randell	DSHS – JRA Fiscal Program Manager
Dave Fish	Dye Management Group, Inc.
Nellie Petuskey	Dye Management Group, Inc.

*Other subject matter experts attended via telephone or video conference.

E. ECIT Meeting Session 1

Wednesday, April 14, 2004

Name	Representing
Marilyn Bowman	WSDOT – HQ Administrative Services
Dave Davis	WSDOT – HQ Purchasing and Materials Management
Linda Smith	WSDOT – HQ Inventory Management
Kimberly Williams	WSDOT – HQ Management Analyst
Christopher Carlile	OFM – Statewide Accounting
Bruce Cebell	WSDOT – Information Technology
Steve Demell	GA
Rick Hess	WSDOT – Eastern Region
Peggy Nelson	DSHS – FSA PMX-2 Project Manager
Linda Olson	WSDOT – NW Region Purchasing Manager
Steven Wagaman	DOC
Bryan Yarbrough	DSHS – Eastern State Hospital
Louise Drake	DSHS – Financial Analyst
Don Higgins	DSHS – Yakima Valley School Supply Officer
Bill Dye	Dye Management Group, Inc.

Name	Representing
Nellie Petuskey	Dye Management Group, Inc.

F. ECIT Meeting Session 2

Thursday, May 13, 2004

Name	Representing
Marilyn Bowman	WSDOT – HQ Administrative Services
Dave Davis	WSDOT – HQ Purchasing and Materials Management
Linda Smith	WSDOT – HQ Inventory Management
Kimberly Williams	WSDOT – HQ Management Analyst
Rick Hess	WSDOT – ER Stores
Bryan Yarbrough	DSHS – Eastern State Hospital
Louise Drake	DSHS – Financial Analyst
Tom Clay	WSDOT – Maintenance Staff Assistant
Bob Lee	WSDOT – Maintenance Finance Manager
Bruce Cebell	WSDOT – Information Technology
Steven Wagaman	DOC
Steve Demell	GA
Peggy Nelson	DSHS – FSA PMX-2 Project Manager
Margaret Curtin	WSDOT – HQ Management Analyst
Maralee	DSHS – TRACKS
Linda Olson	WSDOT – NW Region Purchasing Manager
Nellie Petuskey	Dye Management Group, Inc.
Dave Fish	Dye Management Group, Inc.

G. ECIT Meeting Session 3

Wednesday, June 16, 2004

Name	Representing
Daren Scoggin	DSHS
Don Higgins	DSHS
Kim Williams	WSDOT – HQ Management Analyst
Rick Hess	WSDOT – Eastern Region

Name	Representing
Bruce Cebell	WSDOT – Information Technology
Peggy Nelson	DSHS – FSA PMX-2 Project Manager
Linda Olson	WSDOT – NW Region
Brian Yarbrough	DSHS
Sue Ellingson	DSHS
Dave Koch	DIS
Nellie Petuskey	Dye Management Group, Inc.
Dave Fish	Dye Management Group, Inc.

Appendix C: ECIT Use Cases

■

Prior to this study, these "Use Cases" were developed by the ECIT to illustrate desired system use scenarios for the new system. The intent of the "Use Cases" is what is important. The ECIT understands that the specific scenario might change, depending on the capabilities and usability features of the chosen solution.

A. Inventory Accounting

1. Use Case 1: Payment for Consumable Inventory Purchase Order

Actor:

Person who prepares payment voucher

Description:

Pay invoice for goods received into consumable inventory. The payment will update, if appropriate, the average unit cost of goods received into the inventory system on the Purchase Order as well as any issues, adjustments and return transactions that occurred between time off receipt and payment and then release for payment to vendor, pending release of warrant, EFT, IAP or JV from the accounting system.

Precondition *(the state of the system that must be present prior to a use case being performed)***:**

- Person logging in has authority to pay bills.
- Open lines on PO have been partially or completely received in the system. (Items have posted to system as "RECEIVED"). This is confirmed by inquiry in the system or Proof of receipt at warehouse (System produced Receiving Report noted with date received at warehouse and by whom).
- Invoice (original) received by Accounting.

Post-condition *(the state of the system at the conclusion of the use case execution)***:**

- Inventory average unit cost matches the payment for items on PO invoice.
- Released for payment to vendor (pending release of warrant, EFT, IAP, JV from accounting system).
- If payment of the invoice resulted in a change of the average unit cost of the item, prices on transactions (Issues, Returns & Adjustments) that occurred between date of item being received and posting of invoice will reflect the new unit cost.

Assumptions:

- AFRS updated (weekly, monthly, and daily) at discretion of agency.
- System tracks physical date of receipt posting and actual date of the receipt of items in warehouse and does the same for all inventory transactions (date issued, dated issue posted, date released for payment)
- System generates (assigns) numbers to transactions (Issues, Returns, Adjustments & Payments) and retains that number in history.
- At any point in the process user has the option to ESC (escape) and SAVE or DELETE entries to that point.

User Action 1:

Log in.

System Response 2:

Verify security, display menu: “Generate Payment Voucher”.

User Action 3:

Selects option “Generate Payment Voucher”, enters PO number or searches (by vendor, date range, commodity or ICP) then selects PO number from results.

System Response 4:

Displays Vendor Name, vendor number (per AFRS) and address (which can be changed if necessary) and all invoices PAID or ON HOLD or PENDING for this PO, all PO lines and coding, quantities received to date, and a drop down list of RECEIVED dates and prompts for entry of INVOICE Number.

User Action 5:

Selects RECEIVED date and enters the INVOICE Number (Note: Invoice number field size should match that in AFRS).

System Response 6:

System will validate the number and warn if it is a duplicate and highlight PO lines for the RECEIVED date selected and displays a CONTINUE button for user to move on to next screen and a CANCEL button to return to menu. User also has the option to EDIT the INVOICE Number if entered wrong or VIEW what has already been entered for that INVOICE Number.

(a) User Action 7:

Selects item line(s) that do not match invoice (one at a time) and enters correct unit costs, discount, and taxable.

System Response 8:

System recalculates each line as costs are changed and recalculates sub-total, validates coding.

User Action 9:

When satisfied with entries, clicks on CONTINUE to go to next screen or if user selects CANCEL they are returned to menu.

System Response 10:

Next screen displays these fields for entry: tax rate and total, shipping discount rate, use tax / location and displays the GRAND TOTAL for this INVOICE # up to this point and as user enters figures in above fields. Buttons displayed with definitions: **HOLD?** *(Entries will remain on hold for a determined number of days),* **CANCEL?** *(All entries will be wiped out),* **ADDITIONAL RECEIPT DATE?** *(Entries remain pending for this INVOICE Number and user is able to pay another invoice for this same PO),* **FINISH?** (Average *unit cost for items on PO will be updated & payment voucher will be generated and a pending release of payment will be created in accounting system).*

User Action 11:

Makes entries or changes to any fields in Number 10, selects appropriate button to continue.

System Response 12:

Displays definition of user choice and prompts “Are you sure?” with **YES** and **NO** buttons.

User Action 13:

Selects **YES** or **NO**

System Response 14:

- If **NO**: Return to Number 10.
- If **YES**: action taken as per selection:
  - **HOLD:** *entries will remain on hold for a determined number of days.*
  - **CANCEL:** *all entries will be wiped out, returns to menu.*
  - **ADDITIONAL RECEIPT DATE:** *entries will be saved as pending for this INVOICE # and user is able to pay another invoice for this same PO.*
  - **FINISH:** average *unit cost for items on PO will be updated & payment voucher will be generated. Released for payment to vendor (pending release of warrant, EFT, IAP, JV from accounting system).* ***EXCEPTION:*** **Credit exceeds invoice (no negative warrants). This exception happens when a Return to Vendor transaction is processed and a payment to the vendor is also initiated: SYSTEM RESPONSE: negative warrants are automatically put in HOLD status and generate an “Exception Report”.**

Alternative Courses:

Other legitimate usage scenarios that can take place within this use case. State the alternative course, and describe any differences in the sequence of steps that take place.

Exceptions:

Describe any anticipated error conditions that could occur during execution of the use case, and define how the system is to respond if the use case execution fails for some unanticipated reason.

- PO number not found.
- PC or system "shut down".
- **Credit exceeds invoice (no negative warrants).**
- Credits applied to invoices (payments).
- Expense differences (a transaction is processed that brings the on hand inventory quantity to "zero", but a value is leftover.
- Rebates and incentive checks.

2. Requirements for Other User Classes:

These are requirements that the accounting workgroup identified but apply to the Use Cases in the other workgroups:

- **Purchasing authority needs to be included on PO's.**
- **Vendor number required on all PO's.**
- **Inventory Transaction types.**
- Physical Inventory Adjustment.
- Donated Inventory (REASON CODE?).
- Surplus/Obsolete Inventory (REASON CODE?).
- Expired Inventory.
- Damaged Inventory (REASON CODE?).
- Used Inventory.
- Error Corrections.
- Warranty Repair/Replacement.
- Return to Vendor (includes the Vendor number, decreases inventory, increases Receivable).
- Return to stock.
- Kits (individual items in inventory mixed or put together to make a new item) (REASON CODE?).

3. Reports for Other User Classes:

These are reports that the accounting workgroup identified but apply to the Use Cases in the other workgroups:

- Payment Voucher.
- Receiving Report.
- PO's Received but not paid.
- Total Inventory Value in warehouse at any given time.
- Invoice Payment Report.
- Reconciliation Report (shows beginning & ending value of inventory, all transaction activity within a date range (physical post date).
- Report by Transaction type.

B. Inventory Management

Management Levels Matrix

0. OFM
1. Executive/Commission
2. Division/Assistant Secretary
3. Section/Program/WSF
4. Regions/ Hospitals
5. Maintenance Areas/Field Office
6. Warehouses/ICP

Use Case		Management Level						
		0	1	2	3	4	5	6
A. Track maximum dollar level	*Intent* – To know how many non-cash assets are liabilities *Description* – Shows dollar value of inventory on hand		X	X	X	X	X	X
B. Calculate turn rate	Intent – To measure the efficiency of the supply management system Description – To measure the efficiency of the supply management system. This report will show the frequency of issues versus level of stock.			X	X	X	X	X
C. Calculate surplus Summary	*Intent* – To recognize surplus inventory in order to manage it *Description* – To recognize surplus inventory in order to manage it. This report will show a dollar value and quantity of items on surplus inventory by location.			X	X	X		X
D. Track usage, forecast by office & by work crew	*Intent* – To manage the flow of operational materials • Historical usage overtime			X	X	X	X	X

	• Can be used for forecasting • Can be used for cost control through more efficient contracting *Description* –							
E. Track adjustments	*Intent* – To show accuracy and inefficiencies on inventory usage • Costs of disposing unused inventory with reason • Shows inaccurate count both + and – adjustments • Justification of inventory system and qualified staff *Description* – Used for forecasting & operations improvements i.e. storage, handling			X	X	X	X	X
F. Identify surplus items	*Intent* – To find an alternate use or disposition of surplus items • Define surplus criteria • Ex min-max seasonal, shelf life, shelf time, policy change, obsolete *Description* – To enable identification of items available for alternate use or disposition as surplus. This report will show item detail, location, and quantity based on surplus criteria.					X	X	X
G. Analyze vendor performance	*Intent* – To verify vendor reliability and value • Vendor managed inventory opportunities • Order accuracy, backorder, timeliness			X		X	X	X

	• Billing accuracy • Product quality • Pricing strategy • Location of area served (if room) *Description* – To verify vendor reliability and value. Match order dates and quantities to receipt dates and quantities for each vendor. Also match invoice pricing to contract pricing.							
H. Track vendor tables	*Intent* – To catalog vendor information *Description* – To maintain an up-to-date list of vendors used to replenish inventory items. Standard name, address, phone and other contract information along with contract information, performance standards, payment terms, order history, and other relevant information.			X		X	X	X
I. Track delivery history	*Intent* – To track receiving efficiency and vendor performance • Will show order date, estimated delivery date, required delivery date versus actual delivery date, partial delivery dates, backorders • Will show quantity ordered versus received *Description* – If distribution, show initial delivery site and customer delivery points, customer received dates					X	X	X

J. Open orders	*Intent* – To have an overview of obligations and unfulfilled orders at a point in time. A consideration of cash flow. • Missed or outstanding orders • Schedule daily work • Items not received from vendor, not provided to customer (to end user) for any reason • Can be used to show $ obligated at a point in time • (either not charged to program or not paid to vendor) *Description* – To provide an overview of obligations and unfilled orders at a point in time in order to manage cash flow. The report will show outstanding orders (unfilled, partially filled), anticipated delivery dates, dollars obligated to vendors.			X	X	X	X	X
K. Stale/expired stock	*Intent* – *Description* – To provide visibility of those items on-hand which have exceeded their expiration dates (or are within a window of time before expiration) or have been in stock without usage for a set period of time.			X		X	X	X
L. Receipt – Stock time	*Intent* – *Description* – To provide visibility of the time it takes to move an item into stock after it has been received.					X	X	X

M. Temporary storage report	*Intent* – *Description* –				X	X	X	X
N. Distribution cost analysis	*Intent* – *Description* –				X	X	X	X
O. Re-order report	*Intent* – *Description* – To provide information about which items should be considered for re-order based on set minimum stockage levels. Items having a balance on-hand of less than the minimum stockage level or a projected on-hand level (based on usage) that will fall below the minimum within a given amount of time.					X	X	X
P. ABC analyses	*Intent* – *Description* – To establish management priorities by determining the "80/20" relationships between various items. Must be able to sort various data in both ascending and descending order.			X	X	X		
Q. Haz Mat Report (Hazardous Materials)	*Intent* – *Description* – To identify known hazardous material in inventory. This should include commodity code, storage location, shelf live, receipt date, ….			X		X	X	X
R. Order History by vendor	*Intent* – *Description* – To provide detailed history of transactions with particular vendors. This will give a trend view of price changes, usage, performance, etc.			X		X	X	X

C. Inventory Operations – Use Cases

1. Use Case 1: Administer Master Records

Actor:
Operations Admin

Description:

Preconditions:
1. Request to Add/Change/Delete
2. Request approved
3. Have valid item information

Post Conditions:

User Action 1:
1. Update system
2. Notify requestor

System Response 1:

Alternative Course:

Expectations:

Comments:

2. Use Case 2: Administer Detail / Warehouse Records

Actor:
Warehouse Manager

Description:

Preconditions:

1. Master record exists

Post Conditions:

User Action 1:

System Response 1:

Alternative Course:

Expectations:

Comments:

3. Use Case 3: Initiate an Order (associated w/Accounting)

Actor:

Order person or inventory person

Description:

Preconditions:

1. Item has an item identifier number and description
2. Unit of order
3. Unit of issue (plus conversion factor for breaking down order units into issue units)
4. Product code and description
5. Last order price
6. Requisition exists if required for authorization

Post Conditions:

User Action 1:

Input or search for generic order info, such as, vendor name or number

System Response 1:

1. Populate fields (changeable fields)
2. Display purchaser's default address for ship to and invoice addresses

User Action 2:

Edit default info and complete all applicable fields, i.e., purchase authority, payment and shipping terms, tax rate, required and estimated delivery dates, comment field.

System Response 2:

1. Assign or prompt for the order number (business rules determined)
2. Display line item fields

User Action 3:

Input or search for commodity code numbers

System Response 3:

1. Line item number
2. Displays pre-conditions from above (pre-fill)

User Action 4:

Enter, edit or search appropriate fields:

1. Commodity code number and description of item
2. Unit of order
3. Unit price
4. Quantity
5. Conversion factor
6. Comment field

System Response 4:

Display extended cost for line item and the accumulated total cost

User Action 5:

Press the Enter key to accept the info and move on to the next line item OR accept to display completed order and to update the system.

System Response 5:

1. Display the line item number and fields
2. Display the completed order with the ability to edit or accept
   - If the response is to edit, system comes back to edit or accept fields
   - If the response is to accept, system saves and updates
3. Print
4. Forward (electronically – business rules determined)

User Action 6:

Repeats User Actions 3, 4, and 5 until the order is completed and accepts option is chosen.

System Response 6:

1. Display completed order with the ability to edit or accept.
   - If the response is to edit, system comes back to edit or accept fields
   - If the response is to accept, system saves and updates
2. Forward (electronically) for approval and assignment of requisition number (business rules determined)

Alternative Course:

Expectations:

Comments:

1. System needs to allow duplicate commodity numbers, with different order units, on the same order.
2. Should have a comment field for each line item and also the entire order.
3. Verify unit of order and unit of issue conversion at the time of purchase.
4. Auto-fill the vendor data but allow changes to the info.
5. Changeable ships to, pay to, and remit to fields.

4. Use Case 4: Receive Item / Locates Where to Store Item (associated with w/Accounting)

Actor:

Warehouse worker

Description:

Preconditions:

1. Identifier (commodity code, purchase order number, bar code on all items or bar code capabilities, unit of measure conversion).

Post Conditions:

User Action 1:

Retrieve Order

System Response 1:

1. Deny (order is not found in the system)
2. Show order (Display Order)
   - Sort TOOL and click on column/field

User Action 2:

1. Input received quantities (physical receipt accomplished)
2. Complete order – accept all items as accurate with quantity shown (the system should auto fill the receipt quantities)
3. Complete order with exceptions – did not receive all the items ordered but will accept what was shipped and will mark the order completed (includes partials).
4. Complete order by line item
5. Sales tax and shipping costs should be changeable at the time of receipt OR by accounting. Adjustments should be allowed by line item and have the ability to split tax and shipping on a line item.

System Response 2:

The system should request confirmation and show the conversion and conversion factor if the issue unit does not equal the order unit.

User Action 3:

Accept or change

System Response 3:

Save and update, per authority level

Alternative Course:

Expectations:

Comments:

Need a “comments” block or field.

5. Use Case 5: Issue / Request (creates a pick ticket)

Actor:
Requestor

Description:

Request/Issue item out of inventory all electronic process (auto-fill fields).

Preconditions:

1. Warehouse carries the item
2. Request is pre-approved
3. Enough quantity on hand to fill/issue ticket
4. Complete & accurate information on issue ticket
5. Correct charge/cost codes
6. Correct product (commodity item) information
7. Correct unit of issue & order/sell unit
8. System auto down loads all orders

Post Conditions:

User Action 1:
Submit issue ticket to system

System Response 1:
System creates pick sheet that show the warehouse locations where stock is stored.

Alternative Course:

Expectations:

Comments:

1. The "request" does not subtract from the inventory quantity on hand.
2. The item selection process should be similar to shopping on the Internet using a shopping cart.
3. The issue / request form should have default charge codes with the option to change this code for each line item.

6. Use Case 6: Issue/Fill (associated w/Accounting)

Actor:
Warehouse Staff

Description:
Physically filling an order

Preconditions:

1. Pick sheet / PDA
2. All items bar coded & labeled
3. Bar code scanner
4. System allocates quantity on hand

Post Conditions:

User Action 1:

1. Select & identify (scanner or pencil) items
2. Enter/confirm quantity
3. Package order – affix shipping label, packing list – system generated
4. Update inventory quantity on hand
5. Place in staging area

System Response 1:

Alternative Course:

1. Allows entry of a temporary number if the commodity number is invalid. This may require the system to edit against a crosswalk table.
2. Place the item on back order, if the customer and agency wishes, if quantity on hand is less than the amount requested.

Expectations:

Comments:

1. The inventory system should send the customer notification when their order is filled and shipped.
2. When the request is filled the system should notify inventory to adjust the quantity on hand and notify accounting that the requester can be charged.
3. The system should check other locations if the quantity on hand is insufficient.

7. Use Case 7: Transfers

Actor:
Warehouse Staff

Description:

Preconditions:

1. Transfer request
2. Sufficient stock level

Post Conditions:

User Action 1:

1. Select & identify (scanner or pencil) items
2. Enter/confirm quantity
3. Package order – affix shipping label, packing list – system generated
4. Update inventory quantity on hand
5. Place in staging area

System Response 1:

Alternative Course:

May do a partial shipment or deny the order if the quantity on hand is less than the amount requested.

Expectations:

Comments:

1. This action starts as an "issue request".
2. The inventory system should figure out if the action is a transfer when the requestor enters the "to" and "from" locations.

8. Use Case 8: Returns to Stock (associated w/Accounting)

Actor:
Warehouse Staff

Description:

Preconditions:

1. Proof of issue
2. Within "return window"
3. Acceptable as a returnable item
4. Return document

Post Conditions:

User Action 1:

1. Validate return document
2. Update quantity on hand & customer credit
3. Replace item in bin

System Response 1:

Alternative Course:
Return item to vendor for credit or exchange if it is damaged.

Expectations:

Comments:

9. Use Case 9: Donated Inventory (associated w/Accounting)

Actor:
Warehouse Staff

Description:
Donated inventory

Preconditions:

Type inventory indicator (store type or category). Examples: general commissary versus USDA donated; stores consumables versus stockpiles

Post Conditions:

User Action 1:

System Response 1:

Alternative Course:

Expectations:

Comments:

10. Use Case 10: Vendor Return (associated w/Accounting)

Actor:

Warehouse Staff

Description:

Goods being returned to vendor

Preconditions:

1. Item has been placed into inventory
2. Item is returnable
3. Field exists for return authorization number from vendor
4. Reason codes exist

Post Conditions:

User Action 1:

Identify item, quantity, return number, order number, comments, dollar value (per vendor's anticipated credit). Value defaults to user's overhead unless specifics are applicable.

System Response 1:

Reason for return

User Action 2:

Check reason codes

System Response 2:

Display a blank line item field. Repeat for additional line item

User Action 3:

Press the "Enter" key for processing

System Response 3:

Update quantity and value on hand, generate report, generate document / electronic verification

Alternative Course:

Expectations:

Comments:

11. Use Case 11: Defective / Outdated Reductions (associated w/Accounting)

Actor:

Warehouse Staff

Description:

Inventory reductions due to outdate, damaged, or obsolete items

Preconditions:

1. Item has specific shelf life
2. Item has visible or physical damage
3. Obsolete items or discontinued
4. Disposal reason codes exist

Post Conditions:

User Action 1:

Input disposal transaction (charge and line item information)

System Response 1:

Display reason codes

User Action 2:

Check reason codes

System Response 2:

Display second line item blanks

User Action 3:
Repeat above steps, as needed. Final key stroke is pressing Enter

System Response 3:
Quantities and value adjusted, disposal log updated, disposal document created for printing / routing / approval.

Alternative Course:

Expectations:

Comments:

12. Use Case 12: Kits (associated w/Accounting)

Actor:
Warehouse Staff

Description:
Assemble kits from inventory items.

Preconditions:
1. Components are inventory items
2. Ability to enter value without quantity
3. System contains kit component lists and quantities

Post Conditions:

User Action 1:
Input kit commodity code and quantity

System Response 1:
Display component list with changeable quantity and value fields

User Action 2:
Change quantities, as needed. Press “Enter” to process

System Response 2:
Increase or reduce inventory quantity and value, as indicated

Alternative Course:

Expectations:

Comments:

13. Use Case 13: Physical Inventory (associated w/Accounting)

Actor:

Warehouse Staff

Description:

Preconditions:

1. Item list in a logical sequence (system generated – sheet or PDA)
2. Items bar coded & labeled
3. Item tolerance levels established

Post Conditions:

User Action 1:

1. Scan/Identify item & quantity (1st count) (Computer generated list)
2. Update inventory quality on hand – 1st count
3. Update inventory quantity on hand - recount
4. Adjust discrepancies
5. Generate Physical Inventory Adjustments list with value
6. Generate Exception Report

System Response 1:

Alternative Course:

If item's first count is outside of tolerance level the system should require a second count and generate a report of those items.

Expectations:

Comments:

Appendix D: Staff Role Descriptions

■

A. Staff Roles Descriptions

1. Program Manager

- Responsible for the overall success of the project within the time and resources allocated.
- Ensure that the project is delivered to schedule, budget & quality.
- Determine and manage the project scope.
- Responsible for the overall project resources.
- Responsible to interact with all of the key project stakeholders / sponsors and keep them updated of the project proceedings.
- Identify and document the respective project constraints, assumptions.
- Manage to project priorities.
- Assess, quantify, manage and track both internal and external issues/risks relating to project.
- Review and sign off on test approach, plans and schedule.

2. Project Manager

- Develop, maintain and track the custom development project plan.
- Perform the day-to-day management of the project.
- Develop, maintain and track the project plan.
- Develop, maintain and track the data conversion / migration plan.
- Responsible for the work products related to specific system functions.
- Manage effective communication among project team members.
- Track, review progress and manage issues / problems during various staging of testing.
- Interview and select additional team members required for the project.

3. Business Analyst

- Coordinate business requirements definition with subject matter experts.
- Serve as key source of business knowledge in a specific functional area (finance/accounting, warehouse operations, and ordering).
- Assist contract business analysts and data modeler in documenting and redesigning processes, work flows, data flows, business rules, data structures and definitions.
- Advise on changes to business process and procedure and/or Change the system functionality, where possible, via change management procedures based on the results of various testing phases.
- Coordinate the designing and preparation of all test cases, system, integration and acceptance to ensure that business requirements and functional specifications are covered.
- Collect, understand, and transmit the business requirements for the project, and translate these into functional specifications and detailed test plans.
- Document workflows and results of business analysis and obtain sign-off from client on specifications.
- Assist the technical team in translating application functionality into application architecture and the production of a System Functionality document.
- Recommend enhancements and identify new business requirements.
- Schedule and assign work to developers.
- Assist the data conversion specialist in all aspects of data analysis and mapping.

4. Data Modeler

- Participate in requirements development and design sessions.
- Analyze data requirements for the system, and develop a logical data model.
- Ensure that the data model and database design are consistent with agency data standards and data architecture direction.
- Ensure that appropriate business-oriented data definitions are developed for inclusion in the agency's Data Catalog.
- Document data conversion data flow, and data conversion rules and algorithms.
- Develop data conversion functional and technical models.
- Identify relationships between legacy and new system data.
- Develop a logical data architecture of the various staging areas.

- Develop and design a data architecture plan for data conversion.
- Identify non-relational and relational constraints.
- Determine the loading sequence and their dependencies.
- Provide data conversion requirements and design to data conversion developer.

5. SQL Server/DB2 DBA

- Work with the development team to assist in the overall database design, creating normalized databases, tuning queries, assigning indexes and in the creation of triggers and stored procedures.
- Monitor Database Server's health and tuning. Perform periodic and routine maintenance with minimal or no downtime.
- Manage database users and security.
- Assist in Transfer of legacy data and manage and setup of replication topologies as and when necessary.

6. Implementation Services Specialist

- Conduct host interface testing and system configuration.
- Accomplish site setup/installation.
- Provide data conversion support.
- Lead integration of system into the operation of individual warehouse and inventory sites.
- Coordinate pilot testing.
- Provide "go live" support.

7. Hardware Integration Specialist

- Ensure that hardware supporting legacy systems integrates with systems supporting new inventory management system.

8. Workflow Consultant

- Work with DOT Subject Matter experts and managers to design workflows.
- Assist in configuring the system to reflect appropriate workflow options.

9. Inventory Consultant

- Provide best practices in inventory to the project team.
- Assist in configuring the system to reflect best practices for inventory adopted by WSDOT subject matter experts and management.

10. Materials Management Consultant

- Provide best practices in materials management to the project team.
- Assist in configuring the system to reflect best practices for materials management adopted by WSDOT subject matter experts and management.

11. Warehouse Consultant

- Provide best practices in warehouse management to the project team.
- Assist in configuring the system to reflect best practices for warehouse management adopted by WSDOT subject matter experts and management.

12. Infrastructure Support

- Work closely with WSDOT IT department management and staff and assist project staff in setting up hardware, software during development phase of the project.
- Handle installation of new equipment servers and software.
- Provide troubleshooting and repair of project computer hardware and systematic upgrades of software, including updates and patches, on project desktop systems.
- Assist with user account administration for network operating systems, including NT, and other systems in use.
- Assist in researching and troubleshooting network problems, conduct beta testing for implementation of new network operating systems, and assist with emergency data recovery.
- Work closely with database administrator for ensuring effective backup and recovery.
- Keep the server up at all times and provide users with access to the required information when they need it.
- Install and upgrade an SQL Server
- Monitor space requirements and add new storage space (disk drives) when required.

- Establish standards and schedules for database backups. Develop recovery procedures for database and sure that the backup schedules meet the recovery requirements.

13. Interface and Data Conversion Developer

- Analyze requirements developed by the business analyst for financial interface and develop interfaces to TRAINS Finance system.
- Develop scripts to synchronize Inventory System with the finance system on a regular basis (daily/hourly, as needed).
- Work within the Department's legacy technical environment (ADABAS, Natural, COBOL, VSAM).
- Develop technical specifications for conversion of legacy data elements from legacy systems to SQL Server.
- Create a detailed data mapping from the various staging areas to the destination structure (in cooperation with the Data Modeler).
- Create develop, extract, transform and load processes for each database.
- Identify data to be cleaned and develop data cleaning process.
- Develop audit trail and track business metrics.
- Perform benchmark for the entire load process based on the conversion plan and strategy (partial or complete one time load).
- Develop a physical data architecture of the various staging areas.

14. BizTalk Developer

- Analyze requirements developed by the business analyst to interface with the current finance system. These requirements will include an interface between future SAP or other enterprise wide system and the proposed Consumable Inventory System in SQL*Server 2000.
- Configure the subscription and publication of data, and integrate to the proposed CIS.
- Configure the proposed CIS to talk to any other current and future systems within DOT and DIS.
- Implement the middleware solution using Microsoft technologies, a message broker architecture and BizTalk using commercial industry-standard approaches and best practices.

15. .NET Developer

- Take requirements developed by the Business Analyst and work individually or in a group to create a formal design for additional functionality and/or new applications on an e-business service project.
- Develop from these designs using Microsoft .NET technologies.
- Develop code to execute Asset Management functions, Vendor Management functions, Stores Management and Inventory Management function.
- Work closely with other development team members.
- Use a Component based/distributed application environment (COM+).
- Create ASP.NET and VB.NET software developed against SQL 2000 databases using OOP design skills and knowledge (MVC, UML) based on the .NET framework.
- Perform impact analysis on change requests during maintenance phase and fix bugs or make enhancements to the code during the maintenance phases of the project.
- Provide first level support for all testing issues.

16. Documentation Specialist

- Create and refine the user guide and manual.
- Create documentation that is complete, accurate, and accessible to the user in style and presentation.
- Obtain all available information and convey it to the target audience accurately and in an effective manner.
- Diligently observe and report problems and weaknesses that may affect the user.
- Report to Project Manager any variances or expectations of variance in target completion dates for any such documentation.
- Document material electronically, including web publication and use of “webinar” training materials (Computer Based Training).

17. Training Specialist

- Train the user with the new custom developed or vendor supplied product.
- Educate the end-user on new features, functionality and other operational aspects of the product.
- Plan, schedule, organize and conduct specialized training of the application functions based on the user group / target audience.

- Closely coordinate with the other technical and business project team members to get accurate and timely information related to the product.

18. QA Testing

- Maintain and execute test plans with well-defined, reusable test scripts for production applications.
- Conduct software testing to include database impacts, functional scenarios, regression testing, negative testing, error/bug retests and usability.
- Document software defects in the issue tracking system and proactively communicate with software developers, Business Analysts and Project Managers.
- Write test plans for new site enhancements as well as provide thorough documentation for all stages of the QA process.
- Act as point person for all QA issues with development and deployment, and route issues to the appropriate groups for fixes.
- Participate in technical specification process to ensure resulting specifications are complete and testable and address the requested functional requirements.
- Report status/progress to Business Analyst and Project Manager.
- Maintain scripts and test suites for automated software testing tools.
- Maintain manual and automated test script libraries.

19. Subject Matter Expert

- Provide expertise to the project for functional and communication aspects of the project.
- Assist the Business Analyst in defining the requirements of the project.
- Assist the project team with answering questions, clarifications regarding the existing functionality.
- Act as a liaison between project personnel and other WSDOT personnel.
- Be ready to aid the project, related to current data, information, infrastructure, resources that the project may need to resolve roadblocks / bottlenecks.

20. Acceptance Tester

- Execute of all of the identified UAT (User Acceptance Test) cases.
- Ensure that the definition of the tests provide comprehensive and effective coverage of all reasonable aspects of functionality.

- Execute the test cases using sample source documents as inputs and ensure that the final outcomes of the tests are satisfactory.
- Validate that all test case input sources and test case output results are documented and can be audited.
- Document any problems, and work with the project team to resolve problems identified during the tests.
- Sign off on all test cases by signing the completed test worksheets.
- Accept the results on behalf of the relevant user population.
- Document any changes necessary to existing processes and take a lead role locally in ensuring that the changes are made and adequately communicated to other users.

21. Data Entry

- Process data conversions
- Enter data into new system

22. Administrative/Documentation Support

- Build project documentation and communications
- Build system, help desk and user documentation
- Build organization policy and procedure documentation related to new business practices identified by project.

Appendix E: Alternatives

■

Exhibit E-1: Custom Development Alternative 1 – Fiscal Costs, Project Development (Form 2)

FISCAL COSTS, PROJECT DEVELOPMENT	Obj.	DEVELOPMENT PERIOD							GRAND TOTAL
		FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	
Salaries and Wages	(A)	0	$554,400	0	0	0	0	0	$554,400
Employee Benefits	(B)	0	138,600	0	0	0	0	0	138,600
Personal Service Contracts	(CA)	0	0	0	0	0	0	0	0
Communications	(EB)	0	0	0	0	0	0	0	0
Hardware Rent/Lease	(ED)	0	0	0	0	0	0	0	0
Hardware Maintenance	(EE)	0	0	0	0	0	0	0	0
Software Rent/Lease	(ED)	0	0	0	0	0	0	0	0
Software Maintenance & Upgrade	(EE)	0	0	0	0	0	0	0	0
DP Goods/Services	(EL)	0	382,277	0	0	0	0	0	382,277
Other Contractual Services	(ER)	0	1,894,500	0	0	0	0	0	1,894,500
Travel	(G)	0	341,010	0	0	0	0	0	341,010
Hardware Purchase Capitalized	(JC)	0	64,077	0	0	0	0	0	64,077
Software Purchase Capitalized	(JC)	0	189,638	0	0	0	0	0	189,638
Hardware Purchase - Non. Cap	(KA)	0	209,000	0	0	0	0	0	209,000

FISCAL COSTS, PROJECT DEVELOPMENT	Obj.	DEVELOPMENT PERIOD							GRAND TOTAL
		FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	
Software Purchase - Non. Cap	(KA)	0	48,510	0	0	0	0	0	48,510
Hardware Lease/Purchase	(P)	0	0	0	0	0	0	0	0
Software Lease/Purchase	(P)	0	0	0	0	0	0	0	0
Contingency	( )	0	764,403	0	0	0	0	0	764,403
TOTAL DEVELOPMENT		**0**	**$4,586,415**	**0**	**0**	**0**	**0**	**0**	**$4,586,415**

y

Assumptions for Exhibit E-1: Custom Development Alternative 1 – Fiscal Costs, Project Development (Form 2):

Costs – Project costs are "planning level" estimates.

Costs to be Funded – The project costs to be funded consist of the project development costs for the development period (FY2006) displayed in this form. Total project costs to be funded are $4.4 million.

Salaries (A) and Benefits (B) – A total of 15,840 hours of DOT staff time are estimated required for this alternative. Salaries are estimated using a rate of $35.00 per hour. Current salary rates for OIT and Materials Management staff range from $30 – $35 / hour. The top of this range was selected for all salaries to accommodate possible adjustments in the number of hours spent by selected personnel, the cost of backfilling existing staff, and possible future salary increases. Benefits are estimated at 25 percent of salary, based on estimates provided by OFM, 5/11/04.

DP Goods and Services (EL) – This category is for DOT data center and OIT support costs. Cost estimates were provided by the OIT Server Support manager. This includes staff and support costs for setting up and maintaining servers, database, and operating system software within the DOT data center. Cost elements include: personnel costs for maintaining servers and software (other than the developed application), data backup to tape, facilities rack costs, and software assurance costs.

Other Contractual Services (ER) – Estimated costs associated with external resources. External resources include technical consultants and external quality assurance. Hours were estimated using consultant intellectual capital, based on the requirements identified. Hourly rates are based on current market rates. Contracted hours, rates, and total cost by role are contained in Exhibit E-2:

Exhibit E-2: Contractual Information

Role	Hours	Rate	Cost
Project Manager	1600	$175.00	$280,000.00
Business Analysts (3 positions)	4320	$130.00	$561,600.00
SQL Server DBA	700	$95.00	$66,500.00
Data Modeler	820	$130.00	$106,600.00
Interface Data Conversion Developer	1120	$75.00	$84,000.00
Biz Talk Developer	1040	$120.00	$124,800.00
.NET Developer (5 positions)	4800	$75.00	$360,000.00
Documentation Specialist	960	$50.00	$48,000.00
QA Testing (2 positions)	1760	$50.00	$88,000.00
External Quality Assurance	1000	$175.00	$175,000.00
Total			**$1,894,500.00**

Travel (G) – Estimated at 18 percent of contracted costs included in the Other Contractual Service item. Percentage estimate is based on consultant intellectual capital.

Note on Hardware and Software Costs (JC and KA): Estimates for hardware and software costs were based on 2004 prices; these prices were adjusted using a 10 percent inflation factor, considering that they will not be purchased until late 2005 or early 2006.

Hardware Purchase Capitalized (JC) – Capitalized hardware includes the cost of 10 servers, priced at between $5500 and $6000, depending on configuration. Also included are 40 barcode readers at $500 apiece.

Software Purchase Capitalized (JC) –This includes the cost of operating system, database, integration and workflow, and reporting/data mining software.

Hardware Purchase Non Capitalized (KA) – This category includes the cost of PCs for additional contract and state staff required for the project for 21 project staff at $2000 per PC.

Software Purchase **Non Capitalized (KA)** – This category includes the cost of PC software for additional contract and state staff required for the project for 21 project staff at $2100 per PC.

Other (Contingency) – Contingency for this alternative is calculated at 20 percent during the development period. Contingency is shown separate from other costs to facilitate risk management.

Exhibit E-3: Custom Development Alternative 1 – Summary, Operations Incremental Cost of Project (Form 3)

OPERATIONS INCREMENTAL COSTS OF PROJECT	Obj.	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011		GRAND TOTAL
Salaries and Wages	(A)	0	0	$247,800	$180,600	$88,200	$79,800	$79,800	0	$676,200
Employee Benefits	(B)	0	0	61,950	45,150	22,050	19,950	19,950	0	169,050
Personal Service Contracts	(CA)	0	0	0	0	0	0	0	0	0
Communications	(EB)	0	0	0	0	0	0	0	0	0
Hardware Rent/Lease	(ED)	0	0	0	0	0	0	0	0	0
Hardware Maintenance	(EE)	0	0	0	0	0	0	0	0	0
Software Rent/Lease	(ED)	0	0	(200)	(200)	(200)	(200)	(200)	0	(1,000)
Software Maintenance & Upgrade	(EE)	0	0	0	0	0	0	0	0	0
DP Goods/Services	(EL)	0	0	379,751	418,266	460,633	507,236	558,500	0	2,324,387
Other Contractual Services	(ER)	0	0	140,100	140,100	68,100	32,100	(3,900)	0	376,500
Travel	(G)	0	0	0	0	0	0	0	0	0
Hardware Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0

OPERATIONS INCREMENTAL COSTS OF PROJECT	Obj.	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011		GRAND TOTAL
Software Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0
Hardware Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0
Software Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0
Hardware Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0
Software Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0
Contingency	( )	0	0	0	0	0	0	0	0	0
Total Operations		**0**	**0**	**829,401**	**783,916**	**638,783**	**638,886**	**654,150**	**0**	**3,545,137**
Total Outflows		**0**	**4,586,415**	**829,401**	**783,916**	**638,783**	**638,886**	**654,150**	**0**	**8,131,552**
Cumulative Costs			**$4,586,415**	**$5,415,816**	**$6,199,733**	**$6,838,516**	**$7,477,402**	**$8,131,552**	**$8,131,552**	

Assumptions for Exhibit E-3: Custom Development Alternative 1 – Summary, Operations Incremental Cost of Project (Form 3):

Costs – Project costs are "planning level" estimates.

Exhibit E-4: Custom Development Alternative 1 – Current versus Proposed Method Operations (Form 4)

OPERATIONS COSTS	Obj.	FY 2005			FY 2006			FY 2007			FY 2008			FY 2009		
		(a) Current	(b) Project	©=(b)-(a) Increment	(a) Current	(b) Project	©=(b)-(a) Increment	(a) Current	(b) Project	©=(b)-(a) Increment	(a) Current	(b) Project	©=(b)-(a) Increment	(a) Current	(b) Project	©=(b)-(a) Increment
Salaries and Wages	(A)	0	0	0	0	0	0	21,000	268,800	247,800	21,000	201,600	180,600	21,000	109,200	88,200
Employee Benefits	(B)	0	0	0	0	0	0	5,250	67,200	61,950	5,250	50,400	45,150	5,250	27,300	22,050
Personal Service Contracts	(CA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Communications	(EB)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Rent/Lease	(ED)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Maintenance	(EE)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Rent/Lease	(ED)	0	0	0	0	0	0	200	0	(200)	200	0	(200)	200	0	(200)
Software Maintenance & Upgrade	(EE)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DP Goods/Services	(EL)	0	0	0	0	0	0	5,400	385,151	379,751	5,400	423,666	418,266	5,400	466,033	460,633
Other Contractual Services	(ER)	0	0	0	0	0	0	3,900	144,000	140,100	3,900	144,000	140,100	3,900	72,000	68,100
Travel	(G)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contingency	( )	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL OPERATION COSTS		**0**	**0**	**0**	**0**	**0**	**0**	**$35,750**	**865,151**	**829,401**	**$35,750**	**819,666**	**783,916**	**$35,750**	**674,533**	**638,783**
FTE's				**0**			**0**			**0**			**0**			**0**

Exhibit E-5: Custom Development Alternative 1 – Current versus Proposed Method Operations (Form 4) – Cont'd

OPERATIONS COSTS	Obj.	FY 2010			FY 2011											
		(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment
Salaries and Wages	(A)	21,000	100,800	79,800	21,000	100,800	79,800	0	0	0	0	0	0	0	0	0
Employee Benefits	(B)	5,250	25,200	19,950	5,250	25,200	19,950	0	0	0	0	0	0	0	0	0
Personal Service Contracts	(CA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Communications	(EB)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Rent/Lease	(ED)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Maintenance	(EE)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Rent/Lease	(ED)	200	0	(200)	200	0	(200)	0	0	0	0	0	0	0	0	0
Software Maintenance & Upgrade	(EE)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DP Goods/Services	(EL)	5,400	512,636	507,236	5,400	563,900	558,500	0	0	0	0	0	0	0	0	0
Other Contractual Services	(ER)	3,900	36,000	32,100	3,900	0	(3,900)	0	0	0	0	0	0	0	0	0
Travel	(G)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	`0	0	0	0	0	0	0	0
Hardware Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contingency	( )	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL OPERATION COSTS		**35,750**	**674,636**	**638,886**	**35,750**	**689,900**	**654,150**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
FTE's				**0**			**0**			**0**			**0**			**0**

Assumptions for Exhibit E-5: Custom Development Alternative 1 – Current versus Proposed Method Operations (Form 4) – Cont'd

Costs – Project costs are "planning level" estimates.

Costs to be Funded – The project costs to be funded consist of the project development costs for the development period (FY2006). Total project costs to be funded are $4.4 million.

Current (column a):

Salaries & Wages (A) -- Hourly rate for current OIT analyst supporting Consumable Inventory application, projected for FY 2006, is $30.38. These salaries were calculated using a $35 hourly rate, to accommodate future salary increases. (Cost of living increase for 2007 is projected at 1.7 percent, based on estimates from OFM). Based on history, the number of hours is projected at 600 /year. (The highest number of hours per year over the last five years, excluding work on the data mart, was 522.5 for 2002.)

Benefits (B) – Benefits are calculated at 25 percent of Salaries and Wages.

Other contractual services (ER) – The cost of a contract programmer, based on maintenance history for the legacy system, is projected at 60 hours/year, at $65/hour. The highest number of contract programmer hours in the previous five years was 41.5 in 2002.

DP Goods/Services (EL) – These are costs associated with running the mainframe SA system at the DOT data center. OIT staff has estimated current monthly costs to operate the Consumable Inventory system within the DOT data center at $414.00. In developing this monthly cost, the mainframe was assumed to have a six-year life cycle. Data growth is not expected to affect cost significantly, in part because per gigabyte costs of data storage are expected to decrease. The monthly cost has been rounded up to $450 to cover unknowns and variations from month to month in usage.

Software Rent/Lease (ED) -- This covers a single user license for Hyperion Explorer, that allows Materials Management staff access to the Consumable Inventory Data Mart.

Project (column b):

Salaries & Wages (A) -- This includes hours for a Project Manager, .NET Developer, Quality Assurance Tester, and Business Analyst, and Subject Matter Expert at $35/hour starting in FY2007. The number of hours for each of these resources is described in the Description of Alternatives section of this report.

Benefits (B) -- Benefits are calculated at 25 percent of Salaries and Wages.

DP Goods/Services (EL) -- This includes annual server support costs, server and other equipment replacement costs, data backup to tape, software support, and software assurance costs. Equipment replacement costs assumed a four-year replacement cycle. These services will be provided the Department of Transportation's data center. Initial costs provided by DOT were

for costs as of the 2004 fiscal year. A 10 percent annual inflation factor is included to consider salary, hardware and software increases for subsequent years.

Other contractual services (ER) -- This includes hours for a contracted .NET Developer (5280 hours between 2007 and 2010). The rate for this contracted service is estimated at $75.00/hour.

Exhibit E-6: Custom Development Alternative 1 – Benefits Cash Flow Analysis (Form 5)

TANGIBLE BENEFITS	Obj.	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011		TOTAL
Hard $										
Revenues		0	0	0	0	0	0	0	0	0
Reimbursements		0	0	0	0	0	0	0	0	0
Cost Reduction		0	0	0	0	0	0	0	0	0
• Interest savings from inventory reduction	(E)			210,000	345,000	380,000	470,000	510,000		1,915,000
• Improving negotiated discounts	(E)			600,000						600,000
• Savings in freight costs				35,000	10,000	12,000	30,000	35,000		122,000
Other		0	0	0	0	0	0	0	0	0
Soft $										
Cost Avoidance		0	0	0	0	0	0	0	0	0
• Improved productivity for inventory overhead, personnel	(T)			542,500	507,500	402,500	332,500	280,000		2,065,000
• Reduced inventory overhead, supplies & materials	(E)			232,500	217,500	172,500	142,500	120,000		885,000
• Reduction in unused inventory	(E)			1,993,000						1,993,000
• Reduction in inventory adjustments	(EA18)			85,000	85,000	85,000	85,000	85,000		425,000
Other		0	0	0	0	0	0	0	0	0
TOTAL INFLOWS		**0**	**0**	**2,975,500**	**526,250**	**572,000**	**702,500**	**757,500**	**0**	**5,533,750**
CUMULATIVE BENEFITS			**0**	**2,975,500**	**3,501,750**	**4,073,750**	**4,776,250**	**5,533,750**	**5,533,750**	

Assumptions for Exhibit E-6: Custom Development Alternative 1 – Benefits Cash Flow Analysis (Form 5):

Cost reductions:

Inventory reduction -- Implementing this system will provide for efficiencies that will result in an increased "turn rate" (the number of times in a year that inventory turns over) for inventory items. Increasing the number of inventory turns will reduce the amount of inventory required to be kept on hand. This will reduce the overall cost of inventory. These cost reductions were calculated separately for each of the three major inventory areas: stores, stockpiles, and ferries. Current inventory and turn rates were used as a baseline for calculating cost savings. Inventory reductions were calculated as the difference between previous and current year inventory. This figure was then multiplied by the "cost of capital" assumed for this study (4.5percent), to determine the potential cost savings in having cash not tied up in inventory and available for other purposes. These cost savings were assumed to be cumulative from one year to the next.

Because each of these areas has different inventory requirements, turn rate targets were set for each. The current inventory levels and turn rates for each of these areas are described in Exhibit E-7: Turn Rate Targets:

Exhibit E-7: Turn Rate Targets

	Current year inventory	Current turn rate	2007	2008	2009	2010	2011
Stores	$4,300,000	2	2.25	2.5	3	3.5	4
Stockpiles	$9,750,000	0.7	1	1.25	1.5	1.5	1.5
Ferries	$7,800,000	0.3	0.4	0.5	0.6	0.7	0.8

Turn rate targets identified here have been selected which provide a conservative estimate of actual cost savings over the five-year operational period reflected in this study. The turn rate projections discussed in Section I: Background were for illustrative purposes only, and may not always match the turn rates and cost savings provided in this section.

Improving negotiated discounts -- By making it easier to record items into inventory, additional items will be recorded into inventory. For items that are ordered in significant bulk, this will increase the amount that can be predicted for ordering from a vendor annual contract, thus improving the discount rate. This figure ($600,000) represents a 10 percent discount on the $6 million average annual order of snow and ice control chemicals. Currently about $2 million in purchases of this commodity is not recorded in inventory, making it impossible to take advantage of a discount rate for the full $6 million.

Savings in freight costs – By improving order management and negotiated agreements with vendors, it is expected that the percentage of orders subject to freight charges will decrease over time. These calculations assume that 15 percent of orders are currently subject to freight charges, based on the relatively low value of the order and other factors. (For 2003, 30 percent of orders

were $500 or less.) It is also assumed that freight charges average 5 percent of the total order. Using the turn rate targets for each of the inventory areas (as identified in the "Turn Rate Targets" table above), the following targets for percent of orders subject to freight charges were used for these calculations:

Year	Percent of orders subject to freight
2007	10%
2008	8%
2009	6%
2010	4%
2011	2%

Cost Avoidance

Improved productivity for inventory overhead, personnel – Reductions in inventory overhead are calculated as 25 percent of the reductions in inventory (above). Improved personnel productivity is calculated as 70 percent of this amount.

Reduced inventory overhead, supplies and materials -- Reductions in inventory overhead are calculated as 25 percent of the reductions in inventory (above). Supplies and materials related to overhead (including heat and lights for warehouse facilities) are calculated as 30 percent of this amount.

Reduction in unused inventory -- Current unused inventory was determined as items recorded in inventory which have been in inventory for a year or more. It is estimated that 50 percent must be retained for various reasons, and so still has value to DOT. It is estimated that 90 percent of the value of the remaining 50 percent cannot be recovered, and is lost to DOT. It is estimated that all of this loss will be avoided through more accurate and timely ordering.

Reduction in inventory adjustments -- Inventory adjustments represent errors in recording or tracking inventory that has been detected and adjusted in the DOT's financial system. It is estimated that inventory adjustments will be reduced by 50 percent annually.

Exhibit E-8: Best of Breed Package Alternative 2 – Fiscal Costs, Project Development (Form 2)

FISCAL COSTS, PROJECT DEVELOPMENT	Obj.	DEVELOPMENT PERIOD								GRAND TOTAL
		FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011		
Salaries and Wages	(A)	0	244,300	0	0	0	0	0		244,300
Employee Benefits	(B)	0	61,075	0	0	0	0	0		61,075
Personal Service Contracts	(CA)	0	0	0	0	0	0	0		0
Communications	(EB)	0	0	0	0	0	0	0		0
Hardware Rent/Lease	(ED)	0	0	0	0	0	0	0		0
Hardware Maintenance	(EE)	0	0	0	0	0	0	0		0
Software Rent/Lease	(ED)	0	0	0	0	0	0	0		0
Software Maintenance & Upgrade	(EE)	0	0	0	0	0	0	0		0
DP Goods/Services	(EL)	0	105,000	0	0	0	0	0		105,000
Other Contractual Services	(ER)	0	1,246,000	0	0	0	0	0		1,246,000
Travel	(G)	0	224,280	0	0	0	0	0		224,280
Hardware Purchase Capitalized	(JC)	0	35,000	0	0	0	0	0		35,000
Software Purchase Capitalized	(JC)	0	480,000	0	0	0	0	0		480,000
Hardware Purchase - Non. Cap	(KA)	0	172,000	0	0	0	0	0		172,000

FISCAL COSTS, PROJECT DEVELOPMENT	Obj.	DEVELOPMENT PERIOD								GRAND TOTAL
		FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011		
Software Purchase - Non. Cap	(KA)	0	25,200	0	0	0	0	0		25,200
Hardware Lease/Purchase	(P)	0	0	0	0	0	0	0		0
`Software Lease/Purchase	(P)	0	0	0	0	0	0	0		0
Contingency	( )	0	518,972	0	0	0	0	0		518,972
TOTAL DEVELOPMENT		**0**	**$3,111,827**	**0**	**0**	**0**	**0**	**0**	**0**	**$3,111,827**

Assumptions for Exhibit E-8: Best of Breed Package Alternative 2 – Fiscal Costs, Project Development (Form 2):

Costs – Project costs are "planning level" estimates. See Appendix H, Estimated Costs (Chapters VII through IX), for additional cost detail.

Costs to be Funded – The project costs to be funded consist of the project development costs for the development period (FY2006). Total project costs to be funded are $3.1 million.

Salaries and Wages (A) -- Salaries and Wages are calculated at $35 per hour. Actual estimates for OIT and Materials Management staff varied from $30-35 per hour. The higher end of the range was chosen, to accommodate future salary increases.

Employee Benefits (B) -- Estimated at 25 percent of salary, based on estimates provided by the Office of Financial Management.

Other contractual services (ER) This includes the cost of vendor staff (3000 hours at $175/hour) and integrator staff (3640 hours at $150/hour). Also included is the cost of independent quality assurance (1000 hours at $175/hour).

DP Goods/Services (EL) -- This category is for DOT data center and OIT support costs. Cost estimates were provided by the OIT Server Support manager. This includes staff and support costs for setting up and maintaining servers, database, and operating system software within the DOT data center. Cost elements include: personnel costs, tape backup, facilities rack costs, and software assurance costs.

Travel (G) -- Calculated at 18 percent of contractual fees for the vendor, integrator, and independent quality assurance contractors.

Hardware purchased – capitalized (JC) -- This includes the cost of six servers. Servers are priced at between $5500 and $6000 apiece, based on pricing available to state agencies through a master contract arrangement.

Software Purchase capitalized (JC) -- This includes initial software license fee of $425,000. This is the average of license fees for the three top vendors providing consumable inventory software who responded to a cost questionnaire. Also included here is the cost of operating system and database software ($55,000).

Hardware purchased - non-capitalized (KA) -- This includes additional PCs to be purchased for project staff. It is estimated 12 additional PCs will be required, at $2000/PC. This also includes bar code readers and printers. Bar code readers are priced at $500 per reader for 40 readers. Barcode printers are priced at $3200 per printer, for 40 printers.

Software Purchase non-capitalized (KA) -- This includes software for additional PCs to be purchased for project staff. It is estimated 12 additional PCs will be required, at $2100 in software for each.

Contingency – Contingency for this alternative is calculated at 20 percent of all project costs. Contingency is shown separate from other costs to facilitate risk management.

Exhibit E-9: Best of Breed Package Alternative 2 – Summary, Operations Incremental Cost of Project (Form 3)

OPERATIONS INCREMENTAL COSTS OF PROJECT	Obj.	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011		GRAND TOTAL
Salaries and Wages	(A)	0	0	51,800	51,800	51,800	51,800	51,800	0	259,000
Employee Benefits	(B)	0	0	12,950	12,950	12,950	12,950	12,950	0	64,750
Personal Service Contracts	(CA)	0	0	0	0	0	0	0	0	0
Communications	(EB)	0	0	0	0	0	0	0	0	0
Hardware Rent/Lease	(ED)	0	0	0	0	0	0	0	0	0
Hardware Maintenance	(EE)	0	0	0	0	0	0	0	0	0
Software Rent/Lease	(ED)	0	0	(200)	(200)	(200)	(200)	(200)	0	(1,000)
Software Maintenance & Upgrade	(EE)	0	0	92,000	92,000	92,000	92,000	92,000	0	460,000
DP Goods/Services	(EL)	0	0	94,600	104,600	115,600	127,700	141,010	0	583,510
Other Contractual Services	(ER)	0	0	(3,900)	(3,900)	(3,900)	(3,900)	(3,900)	0	(19,500)
Travel	(G)	0	0	0	0	0	0	0	0	0
Hardware Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0
Software Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0
Hardware Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0
Software Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0
Hardware Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0
Software Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0
Contingency	( )	0	0	0	0	0	0	0	0	0
TOTAL OPERATIONS		**0**	**0**	**247,250**	**257,250**	**268,250**	**280,350**	**293,660**	**0**	**1,346,760**
TOTAL OUTFLOWS		**0**	**3,111,827**	**247,250**	**257,250**	**268,250**	**280,350**	**293,660**	**0**	**4,458,587**
CUMULATIVE COSTS			**$3,111,827**	**3,359,077**	**3,616,327**	**3,884,577**	**4,164,927**	**4,458,587**	**4,458,587**	

Assumptions for Exhibit E-9: Best of Breed Package Alternative 2 – Summary, Operations Incremental Cost of Project (Form 3):

Costs – Project costs are "planning level" estimates.

Costs to be Funded – The project costs to be funded consist of the project development costs for the development period (FY2006). Total project costs to be funded are $3.1 million.

Exhibit E-10: Best of Breed Package Alternative 2 – Current versus Proposed Method Operations (Form 4)

OPERATIONS COSTS	Obj.	FY 2005			FY 2006			FY 2007			FY 2008			FY 2009		
		(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment
Salaries and Wages	(A)	0	0	0	0	0	0	21,000	72,800	51,800	21,000	72,800	51,800	21,000	72,800	51,800
Employee Benefits	(B)	0	0	0	0	0	0	5,250	18,200	12,950	5,250	18,200	12,950	5,250	18,200	12,950
Personal Service Contracts	(CA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Communications	(EB)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Rent/Lease	(ED)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Maintenance	(EE)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Rent/Lease	(ED)	0	0	0	0	0	0	200	0	(200)	200	0	(200)	200	0	(200)
Software Maintenance & Upgrade	(EE)	0	0	0	0	0	0	0	92,000	92,000	0	92,000	92,000	0	92,000	92,000
DP Goods/Services	(EL)	0	0	0	0	0	0	5,400	100,000	94,600	5,400	110,000	104,600	5,400	121,000	115,600
Other Contractual Services	(ER)	0	0	0	0	0	0	3,900	0	(3,900)	3,900	0	(3,900)	3,900	0	(3,900)
Travel	(G)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contingency	( )	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL OPERATION COSTS		**0**	**0**	**0**	**0**	**0**	**0**	**$35,750**	**$283,000**	**$247,250**	**$35,750**	**$293,000**	**$257,250**	**$35,750**	**$304,000**	**$268,250**
FTE's				**0**			**0**			**0**			**0**			**0**

Exhibit E-11: Best of Breed Package Alternative 2 – Current versus Proposed Method Operations (Form 4) – Cont'd

OPERATIONS COSTS	Obj.	FY 2010			FY 2011											
		(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment
Salaries and Wages	(A)	$21,000	$72,800	$51,800	$21,000	$72,800	$51,800	0	0	0	0	0	0	0	0	0
Employee Benefits	(B)	5,250	18,200	12,950	5,250	18,200	12,950	0	0	0	0	0	0	0	0	0
Personal Service Contracts	(CA)		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Communications	(EB)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Rent/Lease	(ED)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Maintenance	(EE)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Rent/Lease	(ED)	200	0	(200)	200	0	(200)	0	0	0	0	0	0	0	0	0
Software Maintenance & Upgrade	(EE)	0	92,000	92,000	0	92,000	92,000	0	0	0	0	0	0	0	0	0
DP Goods/Services	(EL)	5,400	133,100	127,700	5,400	146,410	141,010	0	0	0	0	0	0	0	0	0
Other Contractual Services	(ER)	3,900	0	(3,900)	3,900	0	(3,900)	0	0	0	0	0	0	0	0	0
Travel	(G)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contingency	( )	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL OPERATION COSTS		**$35,750**	**$316,100**	**$280,350**	**$35,750**	**$329,410**	**$293,660**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
FTE's																

Assumptions for Exhibit E-11: Best of Breed Package Alternative 2 – Current versus Proposed Method Operations (Form 4) – Cont'd:

Costs – Project costs are "planning level" estimates.

Costs to be Funded – The project costs to be funded consist of the project development costs for the development period (FY2006). Total project costs to be funded are $2.9 million.

Current (column a):

Salaries & Wages (A) -- Hourly rate for current OIT analyst supporting Consumable Inventory application, projected for FY 2006, is $30.38. These salaries were calculated using a $35 hourly rate, to accommodate future salary increases. (Cost of living increase for 2007 is projected at 1.7 percent, based on estimates from OFM). Based on history, the number of hours is projected at 600 /year. (The highest number of hours per year over the last five years, excluding work on the data mart, was 522.5 for 2002.)

Benefits (B) – Benefits are calculated at 25 percent of Salaries and Wages.

Other contractual services (ER) – The cost of a contract programmer, based on maintenance history for the legacy system, is projected at 60 hours/year, at $65/hour. The highest number of contract programmer hours in the previous five years was 41.5 in 2002.

DP Goods/Services (EL) – These are costs associated with running the mainframe SA system at the DOT data center. OIT staff has estimated current monthly costs to operate the Consumable Inventory system within the DOT data center at $414.00. In developing this monthly cost, the mainframe was assumed to have a six-year life cycle. Data growth is not expected to affect cost significantly, in part because costs per gigabyte of data storage are expected to decrease. The monthly cost has been rounded up to $450 to cover unknowns and variations from month to month in usage.

Software Rent/Lease (ED) -- This covers a single user license for Hyperion Explorer, that allows Materials Management staff access to the Consumable Inventory Data Mart.

Project (column b):

Salaries & Wages (A) -- Salaries and Wages are calculated at $35 per hour. Actual estimates for OIT and Materials Management staff varied from $30 – $35 per hour. The higher end of the range was chosen to accommodate future salary increases.

Benefits (B) -- Benefits are calculated at 25 percent of Salaries and Wages.

DP Goods/Services (EL) -- This category is for DOT data center and OIT support costs. Cost estimates were provided by the OIT Server Support manager. This includes staff and support costs for maintaining and replacing servers, database, and operating system software within the DOT data center. Equipment replacement costs assumed a four-year replacement cycle. Cost

elements include personnel costs, data backup, hardware replacement costs, and software assurance costs.

Software Maintenance & Upgrade -- This category includes the cost of annual license maintenance fees paid to the software vendor. This was calculated as an average of annual maintenance charged by the 3 vendors surveyed, or roughly 21 percent of the original software purchase cost.

Exhibit E-12: Best of Breed Package Alternative 2 – Benefits Cash Flow Analysis (Form 5)

TANGIBLE BENEFITS	Obj.	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011		TOTAL
Hard $										
Revenues		0	0	0	0	0	0	0	0	0
Reimbursements		0	0	0	0	0	0	0	0	0
Cost Reduction		0	0	0	0	0	0	0	0	0
• Interest savings from inventory reduction	(E)			210,000	345,000	380,000	470,000	510,000		1,915,000
• Improving negotiated discounts	(E)			600,000						600,000
• Savings in freight costs				35,000	10,000	12,000	30,000	35,000		122,000
Other		0	0	0	0	0	0	0	0	0
Soft $										
Cost Avoidance		0	0	0	0	0	0	0	0	0
• Improved productivity for inventory overhead, personnel	(T)			542,500	507,500	402,500	332,500	280,000		2,065,000
• Reduced inventory overhead-supplies & materials	(E)			232,500	217,500	172,500	142,500	120,000		885,000
• Reduction in unused inventory	(E)			1,993,000						1,993,000
• Reduction in inventory adjustments	(EA18)			85,000	85,000	85,000	85,000	85,000		425,000
Other		0	0	0	0	0	0	0	0	0
TOTAL INFLOWS		**0**	**0**	**2,975,500**	**526,250**	**572,000**	**702,500**	**757,500**	**0**	**5,533,750**
CUMULATIVE BENEFITS			**0**	**2,975,500**	**3,501,750**	**4,073,750**	**4,776,250**	**5,533,750**	**5,533,750**	

Assumptions for Exhibit E-12: Best of Breed Package Alternative 2 – Benefits Cash Flow Analysis (Form 5):

Cost reductions:

Inventory reduction – Implementing this system will provide for efficiencies that will result in an increased "turn rate" (the number of times in a year that inventory turns over) for inventory items. Increasing the number of inventory turns will reduce the amount of inventory required to keep on hand. This will reduce the overall cost of inventory. These cost reductions were calculated separately for each of the three major inventory areas: stores, stockpiles, and ferries. Current inventory and turn rates were used as a baseline for calculating cost savings. Inventory reductions were calculated as the difference between previous and current year inventory. This figure was then multiplied by the "cost of capital" assumed for this study (4.5 percent), to determine the potential cost savings in having cash not tied up in inventory and available for other purposes. These cost savings were assumed to be cumulative from one year to the next.

Because each of these areas has different inventory requirements, turn rate targets were set for each. The current inventory levels and turn rates for each of these areas are described in Exhibit E-13: Turn Rate Targets.

Exhibit E-13: Turn Rate Targets

	Current year inventory	Current turn rate	2007	2008	2009	2010	2011
Stores	$4,300,000	2	2.25	2.5	3	3.5	4
Stockpiles	$9,750,000	0.7	1	1.25	1.5	1.5	1.5
Ferries	$7,800,000	0.3	0.4	0.5	0.6	0.7	0.8

Turn rate targets identified here have been selected which provide a conservative estimate of actual cost savings over the five-year operational period reflected in this study. The turn rate projections discussed in Section I: Background were for illustrative purposes only, and may not always match the turn rates and cost savings provided in this section.

Improving negotiated discounts – By making it easier to record items into inventory, additional items will be recorded into inventory. For items which are ordered in significant bulk, this will increase the amount that can be predicted for ordering from a vendor annual contract, thus improving the discount rate. This figure ($600,000) represents a 10 percent discount on the $6 million average annual order of snow and ice control chemicals. Currently about $2 million in purchases of this commodity is not recorded in inventory, making it impossible to take advantage of a discount rate for the full $6 million.

Savings in freight costs – By improving order management and negotiated agreements with vendors, it is expected that the percentage of orders subject to freight charges will decrease over time. These calculations assume that 15 percent of orders are currently subject to freight charges,

based on the relatively low value of the order and other factors. (For 2003, 30 percent of orders were $500 or less.) It is also assumed that freight charges average 5 percent of the total order. Using the turn rate targets for each of the inventory areas (as identified in the "Turn Rate Targets" table above), the following targets for percent of orders subject to freight charges were used for these calculations:

Year	Percent of orders subject to freight
2007	10%
2008	8%
2009	6%
2010	4%
2011	2%

Cost Avoidance

Improved productivity for inventory overhead, personnel – Reductions in inventory overhead are calculated as 25 percent of the reductions in inventory (above). Improved personnel productivity is calculated as 70 percent of this amount.

Reduced inventory overhead, supplies and materials – Reductions in inventory overhead are calculated as 25 percent of the reductions in inventory (above). Supplies and materials related to overhead (including heat and lights for warehouse facilities) are calculated as 30 percent of this amount.

Reduction in unused inventory – Current unused inventory was determined as items recorded in inventory which have been in inventory for a year or more. It is estimated that 50 percent must be retained for various reasons, and so still has value to DOT. It is estimated that 90 percent of the value of the remaining 50 percent cannot be recovered, and is lost to DOT. It is estimated that all of this loss will be avoided through more accurate and timely ordering.

Reduction in inventory adjustments – Inventory adjustments represent errors in recording or tracking inventory that has been detected and adjusted in the DOT's financial system. It is estimated that inventory adjustments will be reduced by 50 percent annually.

Exhibit E-14: ERP Package (SAP) Alternative 3 – Fiscal Costs, Project Development (Form 2)

FISCAL COSTS, PROJECT DEVELOPMENT	Obj.	DEVELOPMENT PERIOD								GRAND TOTAL
		FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012		
Salaries and Wages	(A)	0	310,800	0	0	0	0	0	0	310,800
Employee Benefits	(B)	0	77,700	0	0	0	0	0	0	77,700
Personal Service Contracts	(CA)	0	0	0	0	0	0	0	0	0
Communications	(EB)	0	0	0	0	0	0	0	0	0
Hardware Rent/Lease	(ED)	0	0	0	0	0	0	0	0	0
Hardware Maintenance	(EE)	0	0	0	0	0	0	0	0	0
Software Rent/Lease	(ED)	0	0	0	0	0	0	0	0	0
Software Maintenance & Upgrade	(EE)	0	0	0	0	0	0	0	0	0
DP Goods/Services	(EL)	0	0	0	0	0	0	0	0	0
Other Contractual Services	(ER)	0	1,899,000	0	0	0	0	0	0	1,899,000
Travel	(G)	0	305,220	0	0	0	0	0	0	305,220
Hardware Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0
Software Purchase Capitalized	(JC)	0	325,000	0	0	0	0	0	0	325,000
Hardware Purchase - Non. Cap	(KA)	0	176,000	0	0	0	0	0	0	176,000
Software Purchase - Non. Cap	(KA)	0	29,400	0	0	0	0	0	0	29,400
Hardware Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0
Software Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0
Contingency	( )	0	625,025	0	0	0	0	0	0	625,025
TOTAL DEVELOPMENT		**0**	**3,748,145**	**0**	**0**	**0**	**0**	**0**	**0**	**3,748,145**

Assumptions for Exhibit E-14: ERP Package (SAP) Alternative 3 – Fiscal Costs, Project Development (Form 2)

Costs – Project costs are "planning level" estimates.

Costs to be Funded – The project costs to be funded consist of the project development costs for the development period (FY2007). Total project costs to be funded are $3.7 million.

Salaries (A) – Salaries for state employees assigned to the project are calculated at $35/hour.

Benefits (B) – Benefits are estimated at 25 percent of salary, per estimates provided by the Office of Financial Management.

Other Contractual Service (ER) – This includes estimated costs associated with external resources. External resources include integrator consultants, vendor consultants, and external quality assurance. Hours, rates, and costs by role are contained in Exhibit E-15: SAP Contractual Cost Detail, SAP Contractual Cost Detail.

Exhibit E-15: SAP Contractual Cost Detail

Role	Hours	Rate	Cost
Vendor (SAP) Staff			
Project Manager	1120	$275.00	$308,000.00
Workflow Consultant	800	237.50	190,000.00
Inventory Consultant	880	237.50	209,000.00
Materials Management Consultant	1120	237.50	266,000.00
Warehouse Consultant	1040	237.50	247,000.00
Integrator Staff			0
Project Manager	560	150.00	84,000.00
Business Process Analyst	1120	150.00	168,000.00
Data Analyst	560	150.00	84,000.00
SAP Functional Specialist	1120	$150.00	168,000.00
Independent Quality Assurance Staff			0
Quality Assurance Consultant	1000	$175.00	175,000.00
Total			**$1,899,000.00**

Travel (G) – Estimated at 18 percent of Other Contractual Services costs.

Software Purchases Capitalized (JC) – The software licensing cost for DOT use of SAP's inventory and warehouse management functionality is $325,00 for 40 Professional and 160 Limited Professional users.

Hardware purchased - non-capitalized (KA) -- This includes additional PCs to be purchased for project staff. It is estimated 14 additional PCs will be required, at $2000/PC. This also includes bar code readers and printers. Bar code readers are priced at $500 per reader for 40 readers. Barcode printers are priced at $3200 per printer, for 40 printers.

Software Purchase non-capitalized (KA) -- This includes software for additional PCs to be purchased for project staff. It is estimated 14 additional PCs will be required, at $2100 in software for each.

Other (Contingency) – Contingency for this alternative is calculated at 20 percent of all development period costs.

Exhibit E-16: ERP Package (SAP) Alternative 3 – Summary, Operations Incremental Cost of Project (Form 3)

OPERATIONS INCREMENTAL COSTS OF PROJECT	Obj.	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012		GRAND TOTAL
Salaries and Wages	(A)	0	0	51,800	51,800	51,800	51,800	51,800	0	259,000
Employee Benefits	(B)	0	0	12,950	12,950	12,950	12,950	12,950	0	64,750
Personal Service Contracts	(CA)	0	0	0	0	0	0	0	0	0
Communications	(EB)	0	0	0	0	0	0	0	0	0
Hardware Rent/Lease	(ED)	0	0	0	0	0	0	0	0	0
Hardware Maintenance	(EE)	0	0	0	0	0	0	0	0	0
Software Rent/Lease	(ED)	0	0	(200)	(200)	(200)	(200)	(200)	0	(1,000)
Software Maintenance & Upgrade	(EE)	0	0	55,250	55,250	55,250	55,250	55,250	0	276,250
DP Goods/Services	(EL)	0	0	31,600	31,600	31,600	31,600	31,600	0	158,000
Other Contractual Services	(ER)	0	0	(3,900)	(3,900)	(3,900)	(3,900)	(3,900)	0	(19,500)
Travel	(G)	0	0	0	0	0	0	0	0	0
Hardware Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0
Software Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0
Hardware Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0
Software Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0
Hardware Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0
Software Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0
Contingency	( )	0	0	0	0	0	0	0	0	0
TOTAL OPERATIONS		**0**	**0**	**147,500**	**147,500**	**147,500**	**147,500**	**147,500**	**0**	**737,500**
TOTAL OUTFLOWS		**0**	**3,748,145**	**147,500**	**147,500**	**147,500**	**147,500**	**147,500**	**0**	**4,485,645**
CUMULATIVE COSTS			**3,748,145**	**3,895,645**	**4,043,145**	**4,190,645**	**4,338,145**	**4,485,645**	**4,485,645**	

Assumptions for Exhibit E-16: ERP Package (SAP) Alternative 3 – Summary, Operations Incremental Cost of Project (Form 3):

Costs – Project costs are "planning level" estimates.

Costs to be Funded – The project costs to be funded consist of the project development costs for the development period (FY2007). Total project costs to be funded are $3.7 million.

Exhibit E-17: ERP Package (SAP) Alternative 3 – Current versus Proposed Method Operations (Form 4)

OPERATIONS COSTS	Obj.	FY 2006			FY 2007			FY 2008			FY 2009			FY 2010		
		(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment
Salaries and Wages	(A)	0	0	0	0	0	0	21,000	72,800	51,800	21,000	72,800	51,800	21,000	72,800	51,800
Employee Benefits	(B)	0	0	0	0	0	0	5,250	18,200	12,950	5,250	18,200	12,950	5,250	18,200	12,950
Personal Service Contracts	(CA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Communications	(EB)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Rent/Lease	(ED)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Maintenance	(EE)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Rent/Lease	(ED)	0	0	0	0	0	0	200	0	(200)	200	0	(200)	200	0	(200)
Software Maintenance & Upgrade	(EE)	0	0	0	0	0	0	0	55,250	55,250	0	55,250	55,250	0	55,250	55,250
DP Goods/Services	(EL)	0	0	0	0	0	0	5,400	37,000	31,600	5,400	37,000	31,600	5,400	37,000	31,600
Other Contractual Services	(ER)	0	0	0	0	0	0	3,900	0	(3,900)	3,900	0	(3,900)	3,900	0	(3,900)
Travel	(G)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contingency	( )	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL OPERATION COSTS		**0**	**0**	**0**	**0**	**0**	**0**	**35,750**	**183,250**	**147,500**	**35,750**	**183,250**	**147,500**	**35,750**	**183,250**	**147,500**
FTE's				**0**			**0**			**0**			**0**			**0**

Exhibit E-18: ERP Package (SAP) Alternative 3 – Current versus Proposed Method Operations (Form 4) – Cont'd

OPERATIONS COSTS	Obj.	FY 2011			FY 2012											
		(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment	(a) Current	(b) Project	(c)=(b)-(a) Increment
Salaries and Wages	(A)	21,000	72,800	51,800	21,000	72,800	51,800	0	0	0	0	0	0	0	0	0
Employee Benefits	(B)	5,250	18,200	12,950	5,250	18,200	12,950	0	0	0	0	0	0	0	0	0
Personal Service Contracts	(CA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Communications	(EB)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Rent/Lease	(ED)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Maintenance	(EE)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Rent/Lease	(ED)	200	0	(200)	200	0	(200)	0	0	0	0	0	0	0	0	0
Software Maintenance & Upgrade	(EE)	0	55,250	55,250	0	55,250	55,250	0	0	0	0	0	0	0	0	0
DP Goods/Services	(EL)	5,400	37,000	31,600	5,400	37,000	31,600	0	0	0	0	0	0	0	0	0
Other Contractual Services	(ER)	3,900	0	(3,900)	3,900	0	(3,900)	0	0	0	0	0	0	0	0	0
Travel	(G)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Purchase Capitalized	(JC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Purchase - Non. Cap	(KA)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardware Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Software Lease/Purchase	(P)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contingency	( )	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL OPERATION COSTS		**35,750**	**183,250**	**147,500**	**35,750**	**183,250**	**147,500**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
FTE's				**0**			**0**			**0**			**0**			**0**

Assumptions for Exhibit E-17: ERP Package (SAP) Alternative 3 – Current versus Proposed Method Operations (Form 4):

Costs – Project costs are "planning level" estimates.

Costs to be Funded – The project costs to be funded consist of the project development costs for the development period (FY2007). Total project costs to be funded are $3.6 million.

Current (column a):

Salaries & Wages (A) -- Hourly rate for current OIT analyst supporting Consumable Inventory application, projected for FY 2006, is $30.38. These salaries were calculated using a $35 hourly rate, to accommodate future salary increases. (Cost of living increase for 2007 is projected at 1.7 percent, based on estimates from OFM). Based on history, the number of hours is projected at 600 /year. (The highest number of hours per year over the last five years, excluding work on the data mart, was 522.5 for 2002.)

Benefits (B) – Benefits are calculated at 25 percent of Salaries and Wages.

Other contractual services (ER) – The cost of a contract programmer, based on maintenance history for the legacy system, is projected at 60 hours/year, at $65/hour. The highest number of contract programmer hours in the previous five years was 41.5 in 2002.

DP Goods/Services (EL) – These are costs associated with running the mainframe SA system at the DOT data center. OIT staff has estimated current monthly costs to operate the Consumable Inventory system within the DOT data center at $414.00. In developing this monthly cost, the mainframe was assumed to have a six-year life cycle. Data growth is not expected to affect cost significantly, in part because costs per gigabyte of data storage are expected to decrease. The monthly cost has been rounded up to $450 to cover unknowns and variations from month to month in usage.

Software Rent/Lease (ED) -- This covers a single user license for Hyperion Explorer, that allows Materials Management staff access to the Consumable Inventory Data Mart.

Project (column b):

Salaries & Wages (A) -- Salaries and Wages are calculated at $35 per hour. Actual estimates for OIT and Materials Management staff varied from $30-35 per hour. The higher end of the range was chosen, to accommodate future salary increases.

Benefits (B) -- Benefits are calculated at 25 percent of Salaries and Wages.

Software Maintenance & Upgrade (EE) – This is the annual maintenance for use of SAP software by WSDOT's consumable inventory users. It is calculated at 17 percent of the software licensing (purchase) cost ($325,000).

DP Goods/Services (EL) -- This includes barcode equipment replacement costs, calculated as 25 percent of the original purchase costs, assuming a four-year replacement cycle.

Exhibit E-19: ERP Package (SAP) Alternative 3 – Benefits Cash Flow Analysis (Form 5)

TANGIBLE BENEFITS	Obj.	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012		TOTAL
Hard $										
Revenues		0	0	0	0	0	0	0	0	0
Reimbursements		0	0	0	0	0	0	0	0	0
Cost Reduction		0	0	0	0	0	0	0	0	0
• Interest savings from inventory reduction	(E)			210,000	345,000	380,000	470,000	510,000		1,915,000
• Improving negotiated discounts	(E)			600,000						600,000
• Savings in freight costs				35,000	10,000	12,000	30,000	35,000		122,000
Other		0	0	0	0	0	0	0	0	0
Soft $										
Cost Avoidance		0	0	0	0	0	0	0	0	0
• Improved productivity for inventory overhead, personnel	(T)			542,500	507,500	402,500	332,500	280,000		2,065,000
• Reduced inventory overhead-supplies & materials	(E)			232,500	217,500	172,500	142,500	120,000		885,000
• Reduction in unused inventory	(E)			1,993,000						1,993,000
• Reduction in inventory adjustments	(EA18)			85,000	85,000	85,000	85,000	85,000		425,000
• Purchase order process productivity improvement	(T)			19,971	18,973					38,944
Other		0	0	0	0	0	0	0	0	0
TOTAL INFLOWS		**0**	**0**	**2,995,471**	**545,223**	**572,000**	**702,500**	**757,500**	**0**	**5,572,694**
CUMULATIVE BENEFITS			**0**	**2,995,471**	**3,540,694**	**4,112,694**	**4,815,194**	**5,572,694**	**5,572,694**	

Assumptions for Exhibit E-19: ERP Package (SAP) Alternative 3 – Benefits Cash Flow Analysis (Form 5):

Cost reductions:

Inventory reduction -- Implementing this system will provide for efficiencies that will result in an increased "turn rate" (the number of times in a year that inventory turns over) for inventory items. Increasing the number of inventory turns will reduce the amount of inventory required to be kept on hand. This will reduce the overall cost of inventory. These cost reductions were calculated separately for each of the three major inventory areas: stores, stockpiles, and ferries. Current inventory and turn rates were used as a baseline for calculating cost savings. Inventory reductions were calculated as the difference between previous and current year inventory. This figure was then multiplied by the "cost of capital" assumed for this study (4.5 percent), to determine the potential cost savings in having cash not tied up in inventory and available for other purposes. These cost savings were assumed to be cumulative from one year to the next.

Because each of these areas has different inventory requirements, turn rate targets were set for each. The current inventory levels and turn rates for each of these areas are described in Exhibit E-20: Turn Rate Targets.

Exhibit E-20: Turn Rate Targets

	Current year inventory	Current turn rate	2008	2009	2010	2011	2012
Stores	$4,300,000	2	2.25	2.5	3	3.5	4
Stockpiles	$9,750,000	0.7	1	1.25	1.5	1.5	1.5
Ferries	$7,800,000	0.3	0.4	0.5	0.6	0.7	0.8

Turn rate targets identified here have been selected which provide a conservative estimate of actual cost savings over the five-year operational period reflected in this study. The turn rate projections discussed in Section I: Background were for illustrative purposes only, and may not always match the turn rates and cost savings provided in this section.

Improving negotiated discounts – By making it easier to record items into inventory, additional items will be recorded into inventory. For items which are ordered in significant bulk, this will increase the amount that can be predicted for ordering from a vendor annual contract, thus improving the discount rate. This figure ($600,000) represents a 10 percent discount on the $6 million average annual order of snow and ice control chemicals. Currently about $2 million in purchases of this commodity is not recorded in inventory, making it impossible to take advantage of a discount rate for the full $6 million.

Savings in freight costs – By improving order management and negotiated agreements with vendors, it is expected that the percentage of orders subject to freight charges will decrease over time. These calculations assume that 15 percent of orders are currently subject to freight charges,

based on the relatively low value of the order and other factors. (For 2003, 30 percent of orders were $500 or less.) It is also assumed that freight charges average 5 percent of the total order. Using the turn rate targets for each of the inventory areas (as identified in the "Turn Rate Targets" table above), the following targets for percent of orders subject to freight charges were used for these calculations:

Year	Percent of orders subject to freight
2007	10%
2008	8%
2009	6%
2010	4%
2011	2%

Cost Avoidance

Improved productivity for inventory overhead, personnel – Reductions in inventory overhead are calculated as 25 percent of the reductions in inventory (above). Improved personnel productivity is calculated as 70 percent of this amount.

Reduced inventory overhead, supplies and materials – Reductions in inventory overhead are calculated as 25 percent of the reductions in inventory (above). Supplies and materials related to overhead (including heat and lights for warehouse facilities) are calculated as 30 percent of this amount.

Reduction in unused inventory – Current unused inventory was determined as items recorded in inventory which have been in inventory for a year or more. It is estimated that 50 percent must be retained for various reasons, and so still has value to DOT. It is estimated that 90 percent of the value of the remaining 50 percent cannot be recovered, and is lost to DOT. It is estimated that all of this loss will be avoided through more accurate and timely ordering.

Reduction in inventory adjustments – Inventory adjustments represent errors in recording or tracking inventory which have been detected and adjusted in the DOT's financial system. It is estimated that inventory adjustments will be reduced by 50 percent annually.

Improved productivity in order processing – The Government Financial Officers Association (GFOA) has made productivity estimates for state ERP implementations. GFOA indicates a 15 percent improvement in process productivity for "power users" of an ERP system. For this study, the purchase order process was chosen for calculating the value of these improvements. A recent study of this process for WSDOT, done as part of The Ultimate Purchasing System (TUPS) project, found the cost of purchase order processing to be between $65 and $175 per purchase order. For this study, we have used the lower end of this range ($65/purchase order). In 2003, 6145 purchase orders were recorded in the legacy Consumable Inventory system. It is assumed

that WSDOT would experience a 5 percent improvement in productivity during the first year after system implementation, and an additional 10 percent improvement during the second year.

Appendix F: Inventory Turn Rates

■

Exhibit F-1: Inventory Turn Rate on Stores Inventory Levels and Days of Supply

	Annual Amount Issued	Inventory Turn Rate	Average Inventory Level	Days of Supply	Inventory Reduction
Current Data	$8,503,194	1.97	$4,318,374	185.28	
	$8,503,194	2.25	$3,779,197	162.22	$539,177
	$8,503,194	2.50	$3,401,278	146.00	$917,096
	$8,503,194	2.75	$3,092,071	132.73	$1,226,303
Goal	**$8,503,194**	**3.00**	**$2,834,398**	**121.67**	**$1,483,976**

Exhibit F-2: Effect of Inventory Turn Rate on Stores Inventory Levels and Days of Supply

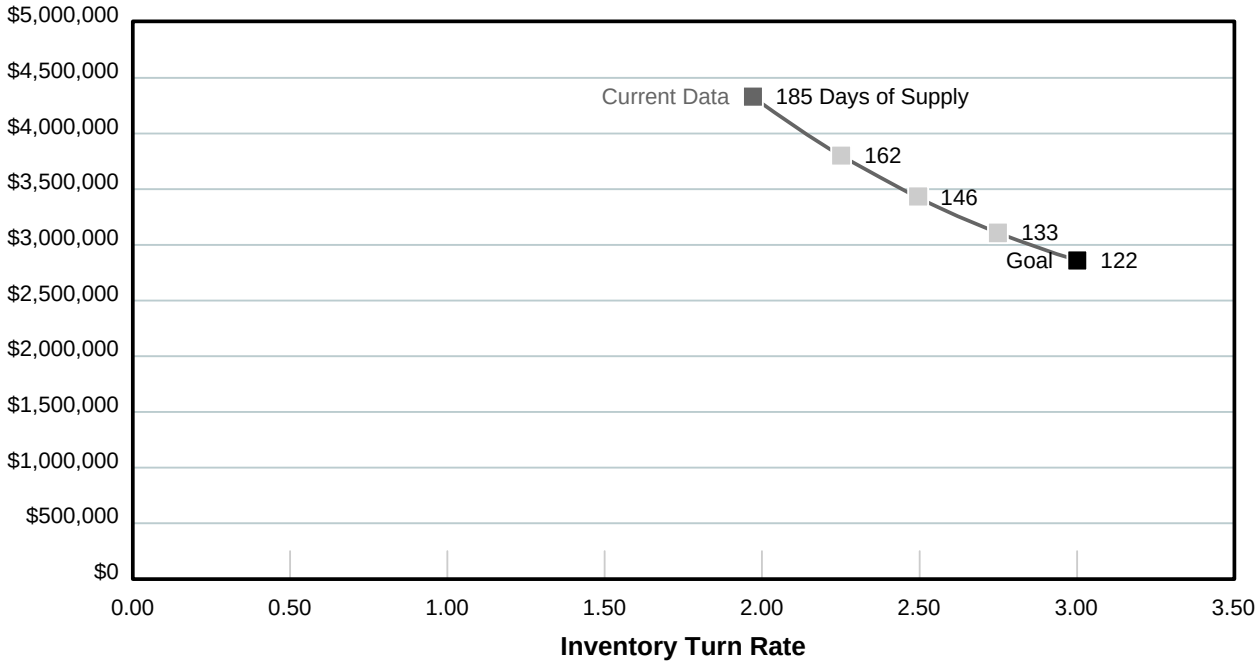


Exhibit F–3: Inventory Turn Rate on WSF Inventory Levels and Days of Supply

	Annual Amount Issued	Inventory Turn Rate	Average Inventory Level	Days of Supply	Inventory Reduction
Current Data	$2,363,760	0.30	$7,824,630	1216.67	
	$2,363,760	0.50	$4,727,520	730.00	$3,097,110
	$2,363,760	0.75	$3,151,680	486.67	$4,672,950
Goal	**$2,363,760**	**1.00**	**$2,363,760**	**365.00**	**$5,460,870**
	$2,363,760	1.25	$1,891,008	292.00	$5,933,622
	$2,363,760	1.50	$1,575,840	243.33	$6,248,790

Exhibit F-4: Effect of Inventory Turn Rate on WSF Inventory Levels and Days of Supply

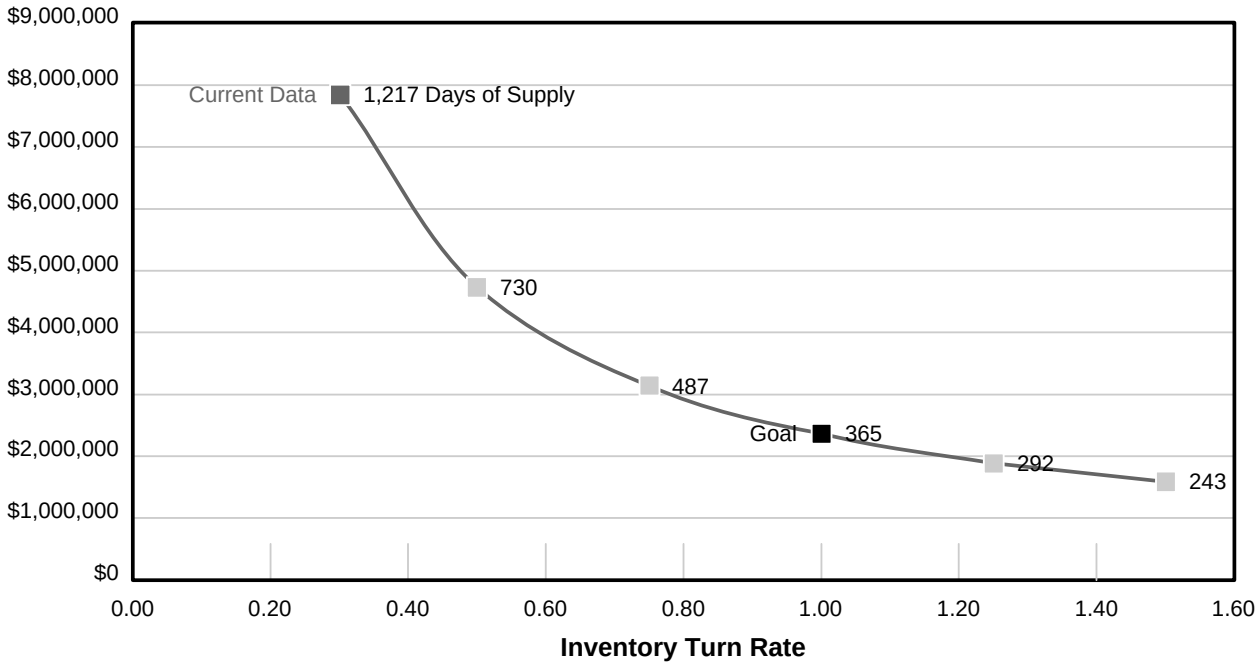


Exhibit F–5: Inventory Turn Rate on Stockpiles Inventory Levels and Days of Supply

	Annual Amount Issued	Inventory Turn Rate	Average Inventory Level	Days of Supply	Inventory Reduction
Current Data	$6,860,603	0.70	$9,754,079	521.43	
	$6,860,603	0.75	$9,147,471	486.67	$606,608
Goal	**$6,860,603**	**1.00**	**$6,860,603**	**365.00**	**$2,893,476**
	$6,860,603	1.25	$5,488,482	292.00	$4,265,597
	$6,860,603	1.50	$4,573,735	243.33	$5,180,344

Exhibit F-6: Effect of Inventory Turn Rate on Stockpiles Inventory Levels and Days of Supply